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Systematics of the Neotropical Moth Family
Dalceridae (Lepidoptera)

SCOTT E. MILLER

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SYSTEMATICS OF THE NEOTROPICAL MOTH FAMILY
DALCERIDAE (LEPIDOPTERA)

SCOTT E. MILLER¹

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ABSTRACT. The family Dalceridae is revised, and descriptions, keys, and illustrations are provided for all 84 species (except the *Acraga infusa* species complex). The family includes 11 genera: *Acraga* (= *Anacraga*, n. syn., *Dalargentina*, n. syn.), *Ca*, *Dalcera*, *Dalcerides* (= *Acragopsis*, n. syn.), *Dalcerina*, *Minacraga*, *Minacragides*, *Minonoa*, *Oroya*, n. gen., *Paracraga*, and *Zikanyrops*. These genera are retained in two subfamilies, Acraginae (*Acraga*, *Dalcerides*, and *Zikanyrops*) and Dalcerinae (all others). The status of *Zikanyrops* is uncertain because no males have been available. Cladistic relationships among the genera are discussed. Dalceridae is tentatively placed in a monophyletic group including Epipyropidae, Limacodidae, and Megalopygidae, but many problems exist in the higher classification of the families associated with Zygaenoidea and Cossioidea. Dalceridae is restricted to the Neotropical Region, except one species, *Dalcerides ingenta* (Hy. Edwards), which occurs as far north as Arizona. The geographical and ecological distributions of all species are reviewed, the latter via Holdridge Life Zones. The slug-shaped larvae, distinctive in their dorsal covering of gelatinous conical tubercules, appear to be general feeders on smooth-leaved trees and shrubs.

INTRODUCTION

Dalceridae is a small family of small to medium-sized moths, restricted to the Neotropical Region, with only one species reaching north of the Tropic of Cancer to Arizona. This is the first comprehensive revision of the family, most species of which were named between 1890 and 1930, usually in very short descriptions limited to gross color patterns. This work includes a revision of the species and a phylogenetic analysis of the genera, facilitating future studies of biology, ecology, biogeography, and relationships of the family.

Historical Review

Although the first species of Dalceridae described were placed in diverse and un-

related families, by the late 1800s they were generally placed in what is now Limacodidae. In 1898, Dyar recognized Dalceridae as a family separate from Limacodidae, albeit without adequate definition. Schaus (1905) and Dyar (1910c) provided keys to genera and characterized the family. Almost all subsequent authors have recognized Dalceridae as a distinct family, although without justifying familial status. Of the seven authors who treated the group as a subfamily of Limacodidae, probably only Hopp (1928a) was truly familiar with dalcerids.

Following a few early descriptions by Herrich-Schäffer (1854), Walker (1855a,b, 1865), Burmeister (1878), Edwards (1882), Jones and Moore (1882), and Druce (1887, 1890, 1901, 1910), most of the species and genera were described by Schaus (1892–1940) and Dyar (1898–1928). Dyar and Schaus worked at the Smithsonian Institution for most of their careers, and most of their specimens are deposited there. Dognin (1907–1923) proposed seven dalcerid species. Hopp (1921, 1922, 1924, 1928a) was the only other significant contributor of names.

The treatment of Dalceridae in Seitz' *Macrolepidoptera of the World* (Sick, 1939) is merely a compilation of translated original descriptions, with many errors in both text and plates. The authors in the United States and Europe often misidentified species proposed by their transatlantic colleagues because they did not see each other's types. An exception was Dognin, who sent his novelties to Schaus or Dyar for approval before description.

The only treatment of dalcerids in a modern context is Orfila's (1961) paper on five Argentinian species, which, however, suffered from lack of comparative material from Brazil.

Dalceridae is generally considered to belong to the superfamily Zygaenoidea, closely related to the Limacodidae and Megalopygidae (e.g., Munroe, 1982; Minet, 1986). However, superfamily affinities of the group of families including the Dal-

ceridae, Epipyropidae, Limacodidae, and Megalopygidae are a major problem, and some authors, starting with Brock (1971), place them in Cossioidea.

Justification of Family Status

Based on the apomorphies discussed below, the Dalceridae is a monophyletic group. Although the sister group of the Dalceridae cannot presently be identified, the dalcerids must be given family rank because all the potential outgroups (e.g., Epipyropidae, Limacodidae, Megalopygidae) are families. Furthermore, dalcerids differ from all Lepidoptera at the level traditionally assigned family rank by moth workers. Thus, for stability in Lepidoptera higher classification, and lacking evidence to the contrary, Dalceridae is retained at family rank.

Apomorphies of the Dalceridae include the following: In forewing venation, the pairing of R_2 with R_3 and R_4 with R_5 is apomorphic within the zygaenoid and cossoid families. Although recognition of homologies in the male genitalia is difficult (see the discussion under Morphology), many (if not most) of the reductions and fusions of parts must be apomorphic, because they have not been found elsewhere in the Lepidoptera. The secondary "accessory glands" of the female genitalia are autapomorphic within the Lepidoptera. Dalcerid larvae possess a dorsal covering of translucent gelatinous tubercles, which is unique in the Lepidoptera. The presence of ventral crochets on abdominal segments 2 and 7 in dalcerid larvae is abnormal within Lepidoptera (see the discussion of Larvae, under Biology of Dalceridae).

Relationships of Dalceridae

Of New World Lepidoptera families, Dalceridae appears to be most closely related to Limacodidae, Megalopygidae, and Epipyropidae. The Limacodidae and Megalopygidae have long been associated with Dalceridae (e.g., Hampson, 1898: 12; Forbes, 1923: 99), and the closeness of Epipyropidae and Dalceridae was recognized

by Jordan (1928: 137), Hopp (1928a: 283), and Heinrich (1931: 3). Adult characters that have been used to associate the families include the following: male antenna bipectinate (Bodine, 1896: 33), ocelli absent, maxillary palpi and proboscis reduced or absent (Philpott, 1926), thoracic sclerite morphology (Shepard, 1930: 244; Brock, 1971), foreleg epiphysis absent, tibial spurs reduced or absent, wing venation (Forbes, 1923: 99), and male genital structure (Eyer, 1924: 317; Heinrich, 1931: 3). The sculptured flange on the pupal eye-piece of Limacodidae and Megalopygidae (Chapman, 1894: 349; Mosher, 1916: 42–43; Holloway, 1986: 52) appears to be present in Dalceridae and may be a synapomorphy for the three families. There are also strong similarities in general adult habitus as well as in larval (Stehr and McFarland, 1985, 1987) and pupal (Mosher, 1916: 43; Heinrich, 1931: 3) morphology. Although these characters have not been adequately surveyed among families of Lepidoptera, many can be hypothesized to be apomorphic because of their apparent uniqueness. Thus, I suggest that Dalceridae, Limacodidae, Megalopygidae, and Epipyropidae form a monophyletic group (although family limits of Limacodidae and especially Megalopygidae have never been adequately defined). The Old World Chrysopolomidae (near Limacodidae) and Somabrachyidae (near Megalopygidae) apparently belong in this group as well, although they may not be worthy of family rank (see the Appendix).

The relationships among the families discussed above remain problematic, and available data do not support the relationships surmised by previous authors. Stehr and McFarland (1985: 36) suggested, based on larval characters, that "... the Megalopygidae ... gave rise to the Dalceridae ... and hence to the Limacodidae Another possibility is to derive ... both the Megalopygidae and Limacodidae from the Dalceridae." Forbes (1942: 392) placed Dalceridae "intermediate between ... [Limacodidae] and Megalopygidae, but

more primitive than either." Many adult characters, especially in male genitalia, of Dalceridae are more derived than those of Limacodidae and Megalopygidae and, in an evolutionary context, could be derived from corresponding characters in one of them, but they do not suggest that the Dalceridae are basal. These relationships can only be resolved by revision of the family level classification of these groups.

Superfamily Placement

Although Dalceridae, Epipyropidae, Limacodidae, and Megalopygidae usually have been placed in Zygaenoidea, and I follow that placement here, that placement is not certain. None of the zygaenoid or cossoid families have ever been adequately defined in terms of apomorphic characters (except parts of Zygaenidae; e.g., Naumann, 1977; Tarmann, 1984). This section will review the families currently included in Zygaenoidea and Cossoidea, reasons that have been proposed for the placement of Dalceridae in each superfamily, and problems in the higher level relationships between Zygaenoidea and Cossoidea.

The Zygaenoidea of most recent authors includes Zygaenidae, Dalceridae, Epipyropidae, Limacodidae, Megalopygidae, and Somabrachyidae (often placed as a subunit of Megalopygidae) as well as the enigmatic Old World families Heterogynidae and Cyclotornidae. The relationships of the zygaenoid families have never been carefully analyzed, and all of them are, in general, poorly known both taxonomically and biologically. Evaluation of these families is outside the scope of this study, but a synopsis of the families is given in the Appendix.

In addition to the questionable placement of Limacodidae and related families in Cossoidea, the rest of the composition of the Cossoidea remains uncertain. The following families have been associated with Cossoidea in the traditional sense: Cossidae, Metarbelidae, Dudgeoneidae, Comptosienidae, and Ratardidae. Metar-

belidae (=Squamurinae of Roepke, 1957) is variously considered a subfamily of Cossidae (Janse, 1925a; Minet, 1986: 299) or placed as a family related to Cossidae (most recent authors, including Holloway, 1986: 42–43; Schoorl, 1990). Dudgeoneidae, traditionally placed in Cossoidea, was transferred to Pyraloidea by Minet (1982: 266; 1983: 182), but he has reversed his opinion (Minet, 1991: 84, 85). Comptosienidae was placed near Cossidae (Dierl, 1970) but has subsequently been placed as a subfamily of Eriocottidae in Tineoidea (Nielsen, 1978; Robinson, 1988). The obscure Indo-Malayan family Ratardidae (Hering, 1925; Holloway, 1986: 41–42) has been placed by recent authors in Cossoidea (e.g., Brock, 1971; Holloway, 1986: 43; Owada, 1993), Geometroidea (*sensu lato*) (Heppner and Wang, 1987), Bombycoidea (e.g., Munroe, 1982; Minet, 1986), or Calliduloidea (Minet, 1987); Alberti (1954: 340) even suggested, with little evidence, placing Ratardidae in or near Zygaenidae. Thus, Cossoidea in the narrowest sense includes only Cossidae, but it has been used to include seven or more families.

Brock (1971), relying primarily on adult thoracic morphology, moved the Chrysopolomidae, Dalceridae, Limacodidae, and Megalopygidae from Zygaenoidea to Cossoidea, while placing (probably due to inadequate representation) Epipyropidae, Heterogynidae, and Somabrachyidae in a diverse, polyphyletic "Tinaeidea." However, Common (1975: 199), Kuznetsov and Stekol'nikov (1981: 64–65), and Minet (1986: 298, 300; 1991: 84, 91) argued against the placement of Limacodidae and related families in Cossoidea. On the basis of larval characters, Stehr (1987: 453–462) also placed the families related to Limacodidae in Zygaenoidea. Kuznetsov and Stekol'nikov pointed out that most of the similarities between Cossidae and Limacodidae in male genital morphology are symplesiomorphies, and they were unable to identify an apomorphy linking the two families. They listed differences in adult circulatory system morphology, larval

morphology, and pupal abdominal morphology that contradict placement of Limacodidae in Cossioidea.

Kuznetsov and Stekol'nikov (1981: 70) concluded that "on the basis of the transfer of the aedoeagal retractor *M4* to the anellus, similarity of structure of the juxta, and . . . morphology of intermediate taxa [Chrysopolomidae], there is support for including the Limacodidae in the Zygaenoidea." Minet (1986) defined his Zygaenoidea on the basis of two apomorphies: (1) the larval head is clearly retractile at least in the last stages, and (2) pupae with stigmata of the second urite hidden by the pterotheca (when these are laid against the abdomen). These authors pointed out, however, that thorough character surveys are necessary to properly define these groups. Until further information is available, I prefer to be conservative and follow the recent reviews of Lepidoptera higher classification by Common (1970, 1975, 1990), Gomez Bustillo (1978), Holloway *et al.* (1987), Kuznetsov and Stekol'nikov (1981), Munroe (1982), Minet (1986, 1991), Nielsen (1989), Nielsen and Common (1991), and Scoble (1992) in retaining Limacodidae and related families in Zygaenoidea (although only Holloway *et al.*, Minet, Munroe, and Nielsen and Common specifically mentioned Dalceridae). Brock (1990: 212, table) appears to have changed his opinion in provisionally including "Eucleoidea" in Zygaeniformia rather than Cossiformia.

Although Heppner (1984: xxi) retained Megalopygidae in Zygaenoidea (along with Heterogynidae and Somabrachyidae), he placed Dalceridae (along with Epipyropidae, Limacodidae, Cyclotornidae, and Chrysopolomidae) in Cossioidea. This placement was apparently based on evidence from the circulatory system noted by Hessel (1969). However, I do not feel that there is evidence at present to place Megalopygidae in a different superfamily from Limacodidae and related families (Hessel, 1969: 365–366, himself agreed). The similarities, some of them unique sim-

ilarities, among the families related to the Dalceridae already discussed strongly contradict their division based on this one character.

The relationships of Zygaenoidea and Cossioidea to each other and the rest of Lepidoptera are not clear. Most reviews of Lepidoptera higher classification have concentrated on either primitive Lepidoptera or selected superfamilies of "higher" Macrolepidoptera, ignoring relationships of groups that are usually considered "intermediate" (e.g., Castnioidea, Cossioidea, Tortricioidea, Zygaenoidea). Kuznetsov and Stekol'nikov (1981: 65, 69) found similarities among the Cossioidea, Tortricioidea, Sesioidea, Zygaenoidea, and Castnioidea, but they could find no apomorphies linking any of them together. Common and Edwards (1981) demonstrated an apparent relationship of Cossioidea to Castnioidea.

Historically, most authors have assumed relationships between Castnioidea or Cossioidea and butterflies, the Papilionoidea and Hesperioidea (e.g., Forbes, 1923: fig. 1; Brock, 1971: fig. 53; Heppner, 1977: fig. 1). However, Scott (1985: 244; 1986: 33–34) cast doubt on these relationships, concluding (Scott, 1986: 34) that "... the Cossioidea–Castnioidea–Zygaenoidea is a derived offshoot of the moth line which could not possibly have produced the butterflies or any other Macrolepidoptera." Scott's ideas need further testing, however, especially in light of new data on the taxonomic composition of the butterflies (Brock, 1989, 1990; Scoble, 1986).

Because of the lack of familial definitions based on apomorphic characters throughout the Lepidoptera, but especially in the zygaenoid and cossoid families, it is presently not possible to define relationships among these taxa. Proper definitions of the families and their relationships will require revisionary work on all their component parts, after they have been segregated into monophyletic units and their diversity has been sampled. My approach to resolving the phylogeny of these families has been to start by defining and

revising a small monophyletic group, the Dalceridae.

Although I have examined all relevant published data and dissected members of many zygaenoid and cossoid families to examine critical characters, this effort has been cursory. The number of dissections required to sample, for example, the world diversity of Limacodidae alone (over 800 described species, with very few published illustrations) is outside the scope of the present revision. Thus, I offer these observations only as a starting point for future research.

Biology of Dalceridae

Very little is known about the immature stages of Dalceridae, and larval and pupal characters have not been utilized in this revision due to lack of representative material. The following generalizations are taken from the meager literature (especially Araujo, 1951; Dyar, 1925b; Genty *et al.*, 1978; Hopp, 1928a; Orlando and Ribeiro, 1955; Stehr and McFarland, 1985, 1987) and unpublished observations of A. Aiello, V. O. Becker, P. Genty, N. McFarland, and myself. The complete life histories of only four species (*Acraga* sp. near *A. infusa*, *Dalcera abrasa*, *Dalcerides ingenta*, and *Dalcerina tijucana*) are known, but larvae of 12 other species have been reared to adults (although for some the only data available are foodplant records on specimen labels). Adults of many species have been observed alive (especially by Becker). Although not enough is known yet about dalcerids to draw conclusions about their ecology, they appear to share many ecological traits with other heavy-bodied moths with nonfeeding adults (e.g., Saturniidae in Janzen, 1984). It is likely, however, that some of the rare dalcerids differ from these patterns.

Adults. Adult dalcerids usually are rare (at least rarely attracted to light), with several specimens per night being a "good catch" at blacklights. They live about a week and cannot feed. Females of most (but not all species) are much rarer than

males at lights; sex ratios in nature are not known.

Dalcerids, especially the larger Dalcerinae, have a weak "fluttering," erratic and undulating, style of flight. When resting on a flat substrate, they hold the wings "tented" loosely over the body, with the plumose fore- and midlegs outstretched, the hindlegs hidden under the wings, and the antennae upright (Fig. 3). This posture is very distinctive and allows their easy recognition. The patterns of colored scales on the legs may even mimic the appearance of a spider in some species such as *Dalcera abrasa*.

Eggs. The small (about 1 mm long in large species), oblong, smooth, often yellow eggs are apparently laid singly and dispersed among vegetation. One female can lay several hundred eggs, which hatch in 8–10 days. When laid, the eggs are coated with a quickly drying fluid that forms a (protective?) layer surrounding them (Fig. 1).

Larvae. The distinctive slug-shaped larvae are oval in outline, flattened dorsoventrally, translucent, hyaline yellow or green, and often with blue, black, yellow, or green stripes (Fig. 2). The dorsal surface is covered with rows of translucent gelatinous conical tubercules, which can become detached when handled. The colors become dull and the tubercules may slough off before larval molts. (Hopp [1928a] describes molting by the fragmenting of the skin in *Acraga flava*, but this has not been observed in other species.) Larvae take 2–6 months to mature, reaching a length of 30 mm in large species.

This dorsal covering of translucent gelatinous tubercules appears to be unique in the Lepidoptera. A possible exception is the limacodid genus *Olona* Snellen (see Cock *et al.*, 1987: 109–110, pl. 30, fig. 4), but I have only seen illustrations, not specimens of *Olona*.

The legs are reduced and the venter is modified into a sluglike, mucus-covered pad. The larvae usually move in the wave-like fashion of a slug. Stehr and McFarland

(1985, 1987) reported that dalcerids are unique among Lepidoptera in having crochets on abdominal segments 2 and 7 in addition to those on segments 3–6. However, M. Epstein (personal communication, 1987) found a megalopygid larva (? *Megalopyge* sp. from Argentina in BMNH) that has crochets on A2 and A7 also.

The larvae are general herbivores and have been recorded from more than 20 plant families (Table 1), but they prefer trees and large shrubs with smooth leaves. They are almost always found on leaves (occasionally on fruits) and seem to prefer sheltered, older leaves toward the center of the plant. Young larvae tend to chew away the surface and skeletonize the leaf in patches, whereas older larvae will eat entire leaves. In the laboratory, larvae can be switched among hosts in several families.

Parasitic flies (Diptera: Tachnidae) and wasps (Hymenoptera: Braconidae and Chalcididae) (Table 2) as well as a fungus (*Beauveria* sp. (Deuteromycetes); Araujo, 1951) have been recorded from immature Dalcerae. Nothing is known of larval predators, which are presumably discouraged by the sluglike shape and gelatinous covering.

Pupae. The white or yellow silken cocoons are usually spun inside clusters of leaves on the hostplant and consist of a loose outer web enclosing a more or less fusiform inner cocoon. There is some diversity in cocoon design (e.g., Dyar, 1925b), perhaps at the generic level. Pupation lasts 1–3 weeks. The pupal shell is extruded from the cocoon during eclosion.

Economic Importance. Dalcerae occasionally are agricultural pests and have been reported damaging the following crops in South America (Table 1): African oil palm (Genty *et al.*, 1978), castor bean (Lourenção *et al.*, 1989), cocoa (Kirkpatrick, 1954), guava (Biezanko, 1961a), and especially coffee (Araujo, 1951, and others) and orange (Gomes and Reiniger, 1939, and others). The appearance of dalcerae as pests is sporadic and localized, but when

larvae occur in large numbers they can cause severe defoliation. What is known of dalcera biology suggests that most species can opportunistically become pests under the right circumstances. Circumstances that may promote expansion of dalcera populations are not known, however.

Mimicry. Some adult dalcerae apparently avoid predation via one of two forms of mimicry. Many of the small orange species are very similar in appearance and behavior (both in flight and at rest) to several immaculate orange species of the geometrid moth genus *Eubaphe* (Fletcher, 1954). These small, orange, weak-flying moths apparently mimic lycid beetles, which are distasteful to predators. Such mimicry occurs throughout the range of Dalcerae, a good example being the mimetic complex based on *Lycus loripes* (Chevrolat) and *Lycus simulans* Schaeffer in Arizona (Linsley *et al.*, 1961) to which *Dalcera ingenta* and *Eubaphe unicolor* (Robinson) apparently belong.

Some of the larger dalcerae, especially *Dalcera abrasa*, may mimic spiders when at rest. They rest with the dark, plumose antennae, forelegs, and midlegs outstretched and the wings "tented" back over the body; the resulting appearance is similar to that of a spider.

METHODS

General Taxonomic Philosophy. In the frequent occurrences of incomplete data for taxonomic decisions, I have been conservative and retained established names where possible, while still reflecting available data. Thus, I have generally chosen to leave established generic and specific names standing, unless there are strong data on which to reduce them to synonymy, and not to erect new names, unless there are strong data to support their differentiation. I do not feel that current knowledge of dalcera distribution and variation allows the use of subspecific names. Whitehead (1972) discussed the practical problems of recognizing taxa, especially spe-

TABLE 1. FOODPLANTS OF DALCERIDAE.^a

Anacardiaceae	
<i>Anacardium occidentale</i> Linnaeus (cashew)—unidentified larva (Brazil, USNM)	
<i>Spondias purpurea</i> Linnaeus— <i>Dalcera abrasa</i>	
Combretaceae	
<i>Terminalia buceras</i> Wright— <i>Paracraga argentea</i>	
* <i>Terminalia catappa</i> Linnaeus— <i>Acraga citrina</i>	
<i>Terminalia</i> sp.— <i>Acraga coa</i>	
Ericaceae	
<i>Arctostaphylos pungens</i> Kunth— <i>Dalcerides ingenta</i>	
Euphorbiaceae	
<i>Adelia triloba</i> (Müller Argoviensis) Hemsley— <i>Paracraga argentea</i>	
* <i>Ricinus communis</i> Linnaeus (castor bean)— <i>Acraga citrinopsis</i> , <i>Acraga citrina</i>	
* <i>Ricinus</i> sp.— <i>Acraga citrina</i>	
Fagaceae	
<i>Quercus emoryi</i> Torrey— <i>Dalcerides ingenta</i>	
<i>Quercus oblongifolia</i> Torrey— <i>Dalcerides ingenta</i>	
Graminae	
<i>Echinochloa polystachia</i> (Kunth) Hitchcock— <i>Dalcera abrasa</i>	
Hippocrateaceae	
<i>Peritassa campestris</i> Cambessèdes— <i>Acraga</i> sp. (orange female, CPAC Lot 5551)	
Lauraceae	
<i>Nectandra</i> sp.— <i>Acraga flava</i>	
Mimosaceae	
<i>Inga</i> sp.—unidentified larva (Venezuela, USNM)	
Myrtaceae	
* <i>Eucalyptus robusta</i> Smith— <i>Dalcera abrasa</i>	
* <i>Eucalyptus saligna</i> Smith— <i>Dalcerina tijucana</i>	
* <i>Eucalyptus</i> sp.— <i>Dalcera abrasa</i>	
<i>Psidium guajava</i> Linnaeus (guava)— <i>Acraga flava</i>	
Ochnaceae	
<i>Ouratea</i> sp.— <i>Dalcerina tijucana</i>	
Olacaceae	
<i>Minquartia guianensis</i> Aublet— <i>Minacraga</i> sp. (died as pupae, Costa Rica, S. Passoa, personal communication, 1989)	
Orchidaceae	
"Orchid"— <i>Dalcerides sofia</i>	
Palmae	
* <i>Elaeis guineensis</i> Jacquin (African oil palm)— <i>Acraga</i> sp. (<i>infusa</i> complex, misidentified by Genty <i>et al.</i> , 1978, as <i>A. ochracea</i>)	
Polygonaceae	
<i>Triplaris felipensis</i> Weddell— <i>Acraga</i> sp. (<i>infusa</i> complex)	
Proteaceae	
* <i>Macadamia</i> sp., probably <i>M. integrifolia</i> Maiden & Betche (macadamia nut)— <i>Minacraga disconitens</i>	
Rhamnaceae	
<i>Colubrina</i> sp.— <i>Dalcerides alba</i>	

TABLE 1. CONTINUED.

Rosaceae

- **Eriobotrya japonica* (Thunberg) Lindley (loquat)—*Acraga moorei*
 **Prunus cerasifera* Ehrhart var. *pissardii* Carrière (cherry plum)—
Paracraga argentea
 **Prunus domestica* Linnaeus (plum)—*Acraga flava*, *Acraga* sp.
 (*infusa* complex)
 **Prunus salicina* Lindley (Japanese plum)—*Acraga* sp.
 (misidentified by Ballou, 1945, as *A. ochracea*)

Rubiaceae

- Alibertia edulis* (L. Richard) A. Richard—*Minacraga plata*
 **Coffea arabica* Linnaeus (coffee)—*Acraga coa*, *A. moorei*, *Dalcerina abrasa*
Uncaria tomentosa (Willdenow) DC—*Paracraga argentea*

Rutaceae

- **Citrus sinensis* (Linnaeus) Osbeck (orange)—*Acraga sexquicentaria*,
Dalcerina tijucana
 **Citrus* sp.—*Acraga coa*

Sapindaceae

- Melicoccus bijugatus* Jacquin—*Acraga citrina*
Paullinia bracteosa Radlkofe—*Dalcerides mesoa*

Sterculiaceae

- Theobroma cacao* Linnaeus (cocoa)—*Acraga* sp. (misidentified by Kirkpatrick,
 1954 and Figueroa Potes, 1977, as *A. ochracea*)

Tiliaceae

- Triumfetta* sp.—unidentified larva (Ecuador, S. J. Weller Lot WE84-136,
 personal communication, 1986)

Ulmaceae

- Trema micrantha* (Linnaeus) Blume—*Paracraga argentea*

^a Most plant identifications are as listed by the collectors; plant voucher specimens are available for only a few records. An asterisk (*) denotes species introduced in the region where collected.

cies, in insect groups for which the only data available are from adult morphology and distribution.

Generic Criteria. Genera recognized are monophyletic groups that are distinguished from related genera by (presumed) apomorphic characters of the following "magnitude":

1. Male genital "groundplan"—major differences in general structure of sociuncus, gnathos, vinculum and/or juxta and/or valvae (individually or in complex), aedeagus, and any processes.
2. Wing venation branching pattern (especially forewing radial veins), but avoiding regions such as the branching of the medial veins from the forewing

cell, as in *Dalcerina*, in which there is considerable individual variation.

3. In *Dalcerinae*, general habitus—major differences in wing coloration or pattern.

Species Criteria. Species generally are separated by consistent and concordant differences in the following:

1. Male genitalia. I have generally used only the presence of or differences in structure or configuration of a part. I have not used minor differences in proportions or relative degree of development of structures because insect genitalia can vary considerably resulting from environmental factors during

TABLE 2. INSECT PARASITES OF DALCERIDAE.^a

Parasite	Host	Locality	Source
Order Diptera			
Family Tachinidae			
" <i>Euphorocera</i> sp."	<i>Dalcerina tijucana</i>	Brazil	Gonçalves and Gonçalves, 1973
<i>Pararrhinactia</i>	<i>Acraga</i> sp.	Trinidad	Kirkpatrick, 1954
<i>parva</i> Townsend			
<i>Pararrhinactia</i> sp.	<i>Acraga</i> sp.	Colombia (San Alberto)	USNM
<i>Pararrhinactia</i> sp.	<i>Acraga</i> sp.	Colombia (Turbo)	USNM
<i>Pararrhinactia</i> sp.	<i>Acraga coa</i>	Costa Rica	USNM
Family Sarcophagidae			
<i>Sarcodexia</i> sp.	<i>Acraga</i> sp.	Colombia	BMNH
Order Hymenoptera			
"Microhymenoptera"	<i>Dalcera abrasa</i>	Brazil	Araujo, 1951
Family Ichneumonidae			
* <i>Isdromas monterai</i> (Lima)	<i>Acraga citrinopsis</i>	Brazil	Santis, 1987
Family Braconidae			
<i>Glyptapanteles dalosoma</i>	<i>Acraga citrinopsis</i>	Brazil	Santis, 1987
Santis			
<i>Pelecystoma</i> sp.	<i>Acraga</i> sp.	Colombia	USNM
Family Chalcididae			
<i>Brachymeria</i> sp.	<i>Acraga</i> sp.	Colombia	USNM
* <i>Conura</i> (<i>Ceratosmicra</i>)	<i>Acraga citrinopsis</i>	Brazil	Santis, 1987
<i>immaculata</i> (Cresson)			
[as <i>C. argentina</i>]			
<i>Conura</i> (<i>Conura</i>) <i>acragae</i>	<i>Acraga</i> sp.	Colombia	Delvare, 1993
Delvare			
Family Perilampidae			
*cf. <i>Perilampus</i> sp.	<i>Dalcerides flavetta</i>	Ecuador	CMNH
*cf. <i>Perilampus</i> sp.	<i>Paracraga halophora</i>	Brazil	BMNH

^a All records of *Acraga* sp. refer to species near *Acraga infusa*. Determinations of parasites by E. E. Grissell (Chalcidoidea), P. M. Marsh (Braconidae), and N. E. Woodley (Tachinidae), all Systematic Entomology Laboratory, U.S. Dept. of Agriculture, N. P. Wyatt (Sarcophagidae), BMNH, G. Delvare, CIRAD, France (Chalcididae), and D. C. Darling (Perilampidae), Royal Ontario Museum. An asterisk (*) denotes probable hyperparasites.

development (e.g., Shapiro, 1979); specimen preparation techniques and mounting angles also can cause apparent distortion.

2. Major differences in wing pattern or coloration. Minor color differences have generally been ignored because subtle colors are easily lost in damaged or old specimens.

In groups where external differences are not significant (especially *Acraga*), I have

utilized genitalia alone to separate species. The same relative level of differentiation was used to separate species in such groups as in groups with both internal and external differences.

Specimen Preparation. Genital and other dissections were prepared in the standard way (Clarke, 1941; Robinson, 1976), stained with Chlorazol black and Safranin O, and either mounted on slides in balsam or kept in glycerin. Almost all drawings were made from specimens in glycerin, to

avoid distortion. Slide mounting is not always satisfactory because of the thick, cylindrical nature of most dalcetid male genitalia, but when slide-mounted the lateral view usually shows the most characters. Wings were bleached and then stained with Eosin Y and mounted in balsam. Five-digit numbers refer to dissections deposited in the USNM, while numbers prefixed with 84-, 85-, 86-, or 87- are deposited in other collections.

Descriptions. The descriptions are generally composite and based largely on the best available specimens. Minor color shades are easily obscured in damaged or old specimens, so many color descriptions are necessarily vague. Many specimens are missing most of the colored body scales, especially those of the head and legs.

Identification Keys. The keys and diagnoses utilize the character states that are most convenient for identification purposes. The male uncus and other genital structures often can be seen adequately for identifications (at least to species-group) after removing the scales from the apex of the abdomen by brushing. All questionable identifications should be verified by dissection.

Locality Names. South American localities, except those in Brazil and the Guianas, generally follow the ornithological gazetteers published by the Bird Department of the MCZ (R. A. Paynter, Jr., and coauthors, 1975–1991). Other standard references are F. Brown (1941; Ecuador), K. Brown (1979), Lamas (1976; Peru), Selander and Vaurie (1962; Central America), Vanzolini and Papavero (1968; Brazil), and the U.S. Board on Geographic Names country gazetteers. In locality lists, added data that are not on the specimen labels (other than minor spelling corrections and expansions) are enclosed in square brackets. All months in dates have been converted to Roman numerals.

The distribution maps were computer-generated, using latitude and longitude coordinates from the gazetteers already cited or appropriate maps. The DI 3000 map-

ping system, as implemented on the Smithsonian Institution's Office of Information Resources Management IBM 4381 computer, was used.

Notes on Locality Names.

1. Specimens labeled only "Para, Brazil/A. Miles Moss" (BMNH, via Rothschild Collection) were collected in the vicinity of Belém between 1911 and 1918 (Moss, 1920: 358–360).
2. Sitio, Costa Rica, an enigmatic locality of William Schaus, is located midway between Juan Viñas and Turrialba, at some 1,000–1,200 m (L. D. Gomez, personal communication, 1985).
3. I have seen several specimens from the MMU and BMNH labeled only "Colombia/Coll. by W. E. Pratt." I know nothing of the localities at which and dates when Pratt collected, but known distribution of several species (e.g., *Acraga hamata*) suggest that at least some were collected in the former part of Colombia that is now Panama. The MMU specimens were received in the C. H. Schill collection in 1893 (C. Johnson, personal communication, 1985), so they were collected before Panama became independent from Colombia.
4. Specimens collected by J. F. Zikan in southern Brazil are usually accurately dated, but they frequently bear incomplete locality data. Zikan's moths, with the exception of a trip to the Amazon from June 1927 to January 1928, were collected at four localities where he lived (butterflies, however, were also collected at other localities) (Mielke, 1971; W. Zikan, personal communication, 1985):
 - XI-1911 to 7-X-1915, Fazenda Jerusalem, Alegre, Espírito Santo;
 - 10-X-1915 to 27-I-1922, Fazenda dos Campos, 1,500 m, Minas Gerais (near Passa Quatro);
 - 28-I-1922 to 29-IX-1923, Passa Quatro, 950 m, Minas Gerais; and
 - 30-IX-1923 to 3-II-1949, Itatiaia (formerly Campo Bello), 400 m, Rio de Janeiro.

Completion Date. Most of the research reported here was completed in 1986. Specimen records seen through 1987 and literature seen through 1993 have been included. Additional specimens will be treated in future papers.

COLLECTIONS CONSULTED

The following collections were consulted during this study. Abbreviations generally follow Heppner and Lamas (1982). I personally visited the AMNH, BMNH, BPBM, CMNH, CNC, CPAC, FSCA, INPA, IOC, LACM, MCZ, MNRJ, PMY, SMEK, UMO, USNM, VOB, and ZSBS during this study, locating many specimens that were placed in incorrect families and would have been missed otherwise. The bulk of the material studied is in the BMNH, USNM, VOB, and ZSBS, and most species are represented in each of these collections. The most important secondary collections are the AMNH, CMNH, CU, LACM, and UCV. For simplicity, I have listed all of Janzen's Costa Rica material as USNM, but duplicates will be distributed to the BMNH and Costa Rica's Instituto Nacional de Biodiversidad.

AJW	Adolfo and Jorge White private collection, Mexico City
AMNH	American Museum of Natural History, New York (F. H. Rindge)
BMNH	British Museum (Natural History), London (D. Carter, M. Honey, A. Watson) [now Natural History Museum]
BPBM	Bishop Museum, Honolulu, Hawaii
CAS	California Academy of Sciences, San Francisco (P. H. Arnaud)
CIBC	Commonwealth Institute of Biological Control, Curepe, Trinidad (S. T. Murphy)
CMNH	Carnegie Museum of Natural History, Pittsburgh (J. Rawlins, C. Young)
CNC	Canadian National Collection,

	Agriculture Canada, Ottawa (J. D. Lafontaine)
CPAC	EMBRAPA—Centro de Pesquisa Agropecuaria dos Cerrados, Planaltina, Brazil (V. O. Becker)
CU	Cornell University, Ithaca, New York (J. K. Liebherr)
FSCA	Florida State Collection of Arthropods, Gainesville (J. B. Heppner)
IML	Fundacion e Instituto Miguel Lillo, Universidad Nacional de Tucumán, San Miguel de Tucumán, Argentina (A. Willink) (no specimens seen)
INPA	Instituto Nacional de Pesquisas da Amazonia, Manaus, Brazil (V. Py-Daniel, J. Adis)
INTA	Departamento de Patología Vegetal, Instituto Nacional de Tecnología Agropecuaria, Castelar, Argentina (H. F. Rizzo) (no specimens seen)
IOC	Instituto Oswaldo Cruz, Rio de Janeiro, Brazil (O. V. Ferreira)
LACM	Natural History Museum of Los Angeles County, Los Angeles (J. P. Donahue, C. L. Hogue)
MBR	Museo Argentino de Ciencias Naturales "Bernardino Rivadavia," Buenos Aires, Argentina (A. O. Bachmann) (no specimens seen)
MCML	Merseyside County Museum (formerly Free Public Museum), Liverpool, England (I. D. Wallace) (no specimens seen)
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts
MHNP	Muséum National d'Histoire Naturelle, Paris (G. Luquet)
MJWC	M. J. W. Cock private collection, Ascot, England
MLP	Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, La Plata, Argentina (R. A. Ronderos) (no specimens seen)
MMU	Manchester Museum, Manches-

	ter University, Manchester, England (C. Johnson)
MPM	Milwaukee Public Museum, Milwaukee, Wisconsin (A. M. Young)
MNRJ	Museu Nacional, Rio de Janeiro, Brazil
NHMV	Naturhistorisches Museum, Vienna, Austria (F. Kasy)
NMVM	Museum of Victoria, Australia (K. Walker) (no specimens seen; checked for F. Walker types)
PMY	Peabody Museum, Yale University, New Haven, Connecticut (D. G. Furth)
RJM	Roberto and Javier de la Maza private collection, Mexico City
RNHL	Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands (R. de Jong)
RT	Rafael Turrent private collection, Mexico City
SDNH	San Diego Natural History Museum, San Diego, California (D. K. Faulkner)
SMEK	Snow Museum of Entomology, University of Kansas, Lawrence (R. Brooks)
SMF	Senckenberg Museum, Frankfurt-am-Main, Germany (H. Schröder)
UCB	Essig Museum of Entomology, University of California, Berkeley (J. A. Powell)
UCR	University of California, Riverside (S. I. Frommer)
UCV	Instituto de Zoología Agrícola, Universidad Central de Venezuela, Maracay, Venezuela (F. Fernandez Yopez)
UMO	University Museum, Oxford University, Oxford, England (M. J. Scoble)
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C. (D. R. Davis)
UWIT	University of the West Indies, St. Augustine, Trinidad (Kirk-

patrick voucher specimens) (P. D. Stiling)

VOB V. O. Becker private collection, Brasilia, Brazil

ZMHB Zoologisches Museum, Humboldt Universität, Berlin, Germany (H. J. Hannemann)

ZMUC Zoologisk Museum, Universitets Copenhagen, Copenhagen, Denmark (N. P. Kristensen)

ZSBS Zoologische Sammlungen des Bayerischen Staates, Munich, Germany (W. Dierl)

I have seen primary type material of all species names except the following—lost, but identifiable from original description: *Acraga boliviana* Hopp, *A. moorei* Dyar, *A. sexquicentenario* (Orfila), *A. sulphurea* (Burmeister), and *Dalcera abrasa* Herrich-Schäffer; lost, not identifiable from original description: *Acraga luteola* (Hopp), *Dalcera haywardi* Orfila, and *Zikanyrops sparsa* Hopp; apparently destroyed, replaced here by neotypes: *Acraga ochracea* (Walker) and *Acraga concolor* (Walker).

MORPHOLOGY

External Morphology

Small to medium-sized moths, with heavy, hairy bodies and broadly rounded wings, usually white, yellow, or orange in ground color.

Head (Fig. 4). Small and densely scaled; lower frontoclypeus naked, covered by up-turned labial palpi; ocelli and chaetosemata absent; proboscis vestigial and densely spinose (Fig. 5); maxillary palpi vestigial (Fig. 6); eyes large; labial palpi two-segmented, short and appressed to frontoclypeus; first palpal segment small, less than twice as long as wide; second palpal segment four to seven times as long as wide.

Antenna. Short, about as long as thorax, broadly bipectinate in males, narrowly bipectinate in females; antenna composed of scape, pedicel, and 18–45 bipectinate flagellar segments; shaft scaled, sometimes with scale tuft at apex. Pectinations bear three types of sensilla (following standard

nomenclature based on external morphology [Callahan, 1975; Wirth and Navai, 1978], which may however lead to lumping of sensilla with different functions [Odendaal *et al.*, 1985]: common type, long, thin, sharp sensilla trichodea cover the pectinations (Fig. 8); less common sensilla chaetica are more stout and usually occur at the tips of pectinations (Fig. 8); and uncommon sensilla coeloconica are scattered among the other sensilla (Fig. 9). Dalcetid sensilla coeloconica are similar to those in other Lepidoptera but lack the normal "picket fence" of inward-pointing spines around the perimeter of the pit.

Thorax. Relatively large and densely scaled. Tympanal organs absent. Small fields of close-set microtrichia present on upper sides of metascutum (wing-locking device joining a field on ventral forewing and present in most Lepidoptera; see Common, 1969; Kuijten, 1974). The circulatory system is of "chamber dorsal-transverse" configuration (Hessel, 1969; only *Dalcerides ingenua* examined). Metathoracic furca (Fig. 48) varies somewhat in relative length and the shape of apophyses (nine species examined) but does not seem to be useful as a generic level character in Dalceridae. Although the metathoracic furca can be very useful at the generic level in some "lower" Lepidoptera, it is not in many "higher" Lepidoptera (e.g., Horak, 1984: 18). Legs densely scaled; tibial spurs and foretibial epiphysis absent.

Forewing. Somewhat ovate, long along base to apex axis, more broadly rounded in females than males. Veins Sc, R system, M_1 , M_2 , M_3 , CuA_1 , CuA_2 , CuP, and $1A+2A$ are present (nomenclature follows Common, 1970). Most of M stem present in discal cell, and radial system forms an accessory cell in Acraginae. Anal loop present (except *Ca* and *Minacragides*). In the radial system, R_1 is either separate or stalked (fused in *Ca*) with the R_{2+3} stem. The stems of R_{2+3} and R_{4+5} are often stalked. R_2 and R_3 are always stalked or fused; R_4 and R_5 are always stalked or fused. The pairing of R_{2+3} and R_{4+5} is unique

among the zygaenoid and cossoid families. Although this is considered the "Ditrysin archetype" by Brock (1971: 36–37), it is probably secondarily derived within the superfamily here (see also Holloway, 1986: 52). Subcostal retinaculum present in males that have a frenulum (except maybe *Zikanyrops*), as a narrow, elongate rolled flap arising from Sc, forming a tube through which the frenulum fits (Braun, 1924; Common, 1970: 769) (Figs. 10–12). A field of microtrichia present on ventral inner margin near base (wing-locking device) (Figs. 23, 24).

Hindwing. Generally same color as forewing, but paler and usually without maculation (except around anal angle). Veins Sc + R_1 , Rs, M_1 , M_2 , M_3 , CuA_1 , CuA_2 , CuP, $1A+2A$, and $3A$ are present ($3A$ apparently present in most preparations but difficult to distinguish from adjacent folds). Most of M stem present in discal cell. Sc + R_1 and Rs free, fused, or connected by a small "bridge" in discal cell. Male frenulum present in most genera, a long bristle (Figs. 13, 14) formed by partial fusion of some 10–30 acanthae (Richards, 1981). In scanning electron microscope (SEM) photographs, 4–14 acanthae are visible from the dorsal side (thus more than half the acanthae; five genera examined). When male frenulum is absent, the humeral angle is somewhat produced (e.g., Fig. 51). Female frenulum (Fig. 15) a clump of long, narrow, unfused scales (more than 15 in dorsal view of *Dalcerides ingenua*). Campaniform sensilla like those described by Brown and Miller (1983: 276) are usually present on the base of the cubital stem of the hindwing (only dorsal sides examined) (Fig. 22).

Neither the Dalceridae nor the relationship of Cossoidea and Zygaenoidea were treated in the wing base study by Sharplin (1964); I have not examined wing base characters due to the specialized dissections required.

Wing Scales. The wing scales of dalcerids vary primarily in gross shape (outline) and the size and spacing of windows

(seven genera examined with SEM). Terminology follows Ghiradella (1984) and Downey and Allyn (1975). General form of scales usually lamellar, mixed with piliform. Lamellar scales usually spatulate, sometimes lanceolate, the apex rounded or dentate (two to four teeth). Upper lamina of "normal" lepidopteran plan. Longitudinal ridges prominent, straight, parallel, composed of overlapping elongate scutes (=lamellae) with elongate basal arms (Fig. 19). Microribs dominate the "flats" between the ridges, virtually obliterating the windows (=areolae, =fenestrae). Windows usually present, small to very small, varying in size and spacing (Fig. 19). The extensive microribs form "ranks of chevron-shaped cuticular rodlets [which] give the scale a characteristically satiny texture" (Ghiradella, 1985: 252). This scale structure, found in most dalcerids, is the "microrib-satin" type of Ghiradella (1984: 643, fig. 6; 1985: 252). The lack of structural diversity agrees with observations by Ghiradella (1985) and Brown and Miller (1983) that there is generally little diversity among species in scale types of a given wing region within most (but not all) Lepidoptera families.

Abdomen. Length about equal to hindwing anal angles, densely scaled, usually the same color as dorsal hindwings. I have not found any useful taxonomic characters in the dalcerid abdominal surface, except the posterior hooklike processes of the eighth tergite of *Minacragides arnaci*.

Sexual Dimorphism. In species where both sexes are known, the sexes are very similar, differing only in the following: female antennal pectinations are short, yielding narrowly bipectinate antennae; female frenula are composed of many unfused bristles; females are larger—the smallest females are about the size of the largest males; and female wings, especially forewing angles, are more broadly rounded. Females are also much less commonly collected than males at lights (with the notable exceptions of *Acraga flava* and *Dalcerides ingenta*).

Male Genitalia (Fig. 25)

The male genitalia of dalcerids are marked by extensive reduction and fusion, especially of the valvae. Recognition of homologies of genital parts, both among dalcerids and in relation to other families, is difficult. Furthermore, the knowledge of Lepidoptera genital morphology and homology in general (e.g., Klots, 1970: 116; Razowski, 1976: 107–117; Zimmerman, 1978: 201–204, 210) is inadequate due to the enormous structural diversity within Lepidoptera, and so does not provide an adequate framework for resolution of difficult cases. I have assigned names primarily on the basis of position relative to "landmarks" such as the aedoeagus and anal tube. Names follow standard usage, but it should be emphasized that the parts designated by the same names are not necessarily homologous throughout the Lepidoptera (Klots, 1970).

Tegumen and *sociuncus* [sensu Sibatani (1972)] generally well developed, frequently fused into one complex. *Uncus* usually bilobed, sometimes with medial and/or lateral points or hooks (especially in *Acraga*). *Socci* sometimes developed as densely hairy pads (in *Minacraga*, *Dalcera*, *Dalcerina*, and *Oroya*); otherwise represented only as poorly defined lateral hairy areas on *sociuncus*. *Gnathos* generally well developed, but taking many forms; two-parted in many genera, with median process(es) in the middle of the genitalia ventral of anal tube, and free lateral arms extending outward near the tegumen/vinculum suture; median process(es) composed of two symmetrical structures, frequently touching but not attached to each other (most *Acraginae*), or fused into one solid structure (most *Dalcerinae*); median process and lateral lobes probably are the cochlear and brachia, respectively, of Ogata *et al.* (1957) and Sibatani (1972). *Vinculum* generally elongate and thin, usually extended anteriorly as long saccus. *Valvae* extremely reduced, immovable, usually only small processes,

frequently fused with juxta, anellus, and/or vinculum; sometimes not recognizable. *Juxta* often present as independent rod; frequently juxta (independently or fused with other parts) forms an external support structure under the aedoeagus extending outward about same distance as aedoeagus (in pinned specimen); sometimes bifid externally; sometimes platelike internally; sometimes fused with valvae, anellus, and/or vinculum. *Anellus* usually cannot be differentiated from surrounding structures, but probably is represented in fused complexes with valvae, juxta, and/or vinculum. *Saccus* generally elongate, sometimes broad. *Aedoeagus* generally long and slender, but can be short and stout (e.g. *Minacraga*), hooked at tip (some *Dalcerides*), or with a single triangular spine externally (*Paracarga*); *vesica* with a small patch of cornuti in some species of *Acraga*.

Sibatani (1972) uses the term sociuncus (=scaphium of Ogata *et al.* [1957]) for the dorsal appendages of the tenth somite including uncus and socii. Ogata *et al.* (1957) discuss the problems in defining units within the sociuncus (see also Stekol'nikov and Kuznetsov, 1986: 139).

An alternative way of naming dalcerid structures would be to consider the socii absent, consider my socii to be gnathos, and my gnathos to be transtilla (compare for example *Minacraga* with Agonoxenidae [=Blastodacnidae] in Gelechioidea; Clarke, 1962; Bradley, 1966). However, because of the difficulties in defining units of the sociuncus, in general, and the homologies of valvae and anellus in Dalceridae (discussed below), I have not applied the term transtilla here.

Processes of the vinculum occur in *Dalcera*, *Dalcerina*, and *Minacraga*, the identity of which has not been resolved; they are probably not homologous with each other. In *Dalcerina*, the process is a semi-circular, slender, flexible rod attached at the middle between the outside of the juxta and the inside of the outer wall of the saccus; it might be related to the bifid "anellus" attached to the vinculum in some

Epipyropidae (see Heinrich, 1931: fig. 5). *Minacraga* have tusk- or bladelike processes arising adjacent to and below the rudimentary valvae; these are reminiscent of the furca described in Geometridae by Okagaki *et al.* (1956) and similar in appearance to processes that occur in some Mimallonidae (e.g. some *Cicinnus* spp.). *Dalcera* has two pairs of setose processes arising from the vinculum-saccus-juxta complex; both appear solidly fused with this complex—one may represent valvae, the other may be the bifid end of a fused juxta. The relationship of the processes discussed above to those in some Limacodidae (e.g., *Euclea cupostigma* Dyar) is unknown and awaits further study (see further comments in the *Minacraga* generic description later).

Throughout the Lepidoptera, the morphology and nomenclature of structures in the region around, and especially ventral to, the aedoeagus is a major problem (e.g. Klots, 1970: 120, 122). Apparently many structures have evolved in multiple ways to meet the general need of supporting the aedoeagus. The general confusion, together with the fusion and reduction in dalcerid genitalia, makes identification of the homology of these processes almost impossible with present knowledge.

Birket-Smith (1965, 1974) introduced several novel concepts to the morphology of male genitalia of Lepidoptera. Application of his ideas remains difficult, because he applied them to representatives of very few families, and subsequent authors have generally ignored his work (see Kanazawa, 1987; Kristensen, 1984: 172-173; Kuznetsov and Stekol'nikov, 1986; Stekol'nikov and Kuznetsov, 1986: 136; Udea, 1978, however). One of his concepts are "valvella," paired structures "mesad of the valvae and laterad or dorso-laterad of juxta . . . often displaced dorsad; they . . . form an independent ventral support for phallos . . . [or] an integrated part of phallos . . . or they may degenerate" (Birket-Smith, 1965: 6). In Birket-Smith's example in Cossidae, the "valvella" have

fused with the juxta as hollow dorsal lobes of it. These fused "valvellae" in *Xyleutes* (the American species formerly placed in *Xyleutes* are now in *Morpheis* [Donahue, 1980; Schoorl, 1990]) are somewhat reminiscent of the vinculum processes in Dalcercinae, but the juxta is a platelike structure well separated from the valvae and vinculum. This structure is well illustrated in the related *Psychonoctua masoni* (Schaus) by Blanchard and Knudson (1985: fig. 16). There is no agreement on the identity of these "valvellae" in the literature, and in *Xyleutes* they are usually considered "lobes" or "ligulae" of the juxta (e.g., Roepke, 1957), "juxta complex" (e.g., Razowski, 1981), or anellus (e.g., Arora, 1976). Until further evidence is available, I prefer not to use the "valvellae" concept.

Birket-Smith (1974: 20-21) also introduced the concept of pseudaeodoeagus versus aedoeagus (the latter including the fused valvellae). However, without definitive means of distinguishing between the two, I continue to use "aedoeagus" in the traditional sense.

Eyer (1924: 318) suggested the valvae of some Megalopygidae are "characterized by a complete separation of the cucullus and sacculus." This suggestion has never been evaluated in detail, but the only subsequent authors to use names for these parts used "harpe" and "sacculus" (Hopp, 1927 and other years), "cucullus" and "sacculus" (Mehta, 1933: fig. 63; Lima, 1945: fig. 62), and "apendice da juxta?" and "sacculus da valva incompleta?" (Oiticica, 1946: 62). Eyer (1924: 318) extended this view to *Dalcerides ingenta* (compare his pl. XXXVIII, figs. 1 and 3), where he suggested the "cucullus is indistinguishably fused with the tegumen, forming a pair of dorsal ear-like lobes." While I cannot disprove this idea, I have not found anything to support it in the dalcercids and am not using it here. I would call Eyer's "ear-like lobes" the sociuncus. Split valvae are also present in some Limacodidae.

Study of the musculature and functional morphology of the genitalia might resolve

these homology problems. However, the only related family that has been appropriately studied is Limacodidae (Kuznetsov and Stekol'nikov, 1981).

Female Genitalia (Fig. 26)

Bursa copulatrix. Sterigma usually a weakly differentiated invagination, sometimes a sclerotized plate, often with a depression or cleft in middle; ostium bursa narrow to broad; ductus bursae relatively long, narrow to broad, usually with one or two strong bends; corpus bursae medium to small, ovate or spherical, without signa. *Ductus seminalis* arising from first half of ductus bursae, usually near a bend. *Spermatheca* with long duct, a portion of which is tightly coiled, ending in a bilobed sac (the spermatheca is often broken or missing in specimens, and this is reflected in the illustrations). *Apophyses anteriores* absent. (The lateral lobes on the anterior edge of the eighth abdominal tergite of some Dalcercidae [e.g., *Dalcerides ingenta*] are not apophyses anteriores, since these lobes occur together with apophyses anteriores in some Megalopygidae [e.g., *Megalopyge defoliata* (Walker)], *Apophyses posteriores* straight and narrow or wide at base, narrowing to apex, short to long. *Papillae anales* large, densely setose; divided by a cleft into upper and lower lobes; the duct from the "accessory glands" opens into the outside end of this cleft.

"*Accessory Glands*" (Miller, 1993). One on each side, closely anterior of papillae anales; ovate or triangular in lateral view, flattened laterally, the outer surface usually covered with convoluted lobes and ridges. The two accessory glands are not connected to each other, only to the outside by short ducts that open onto the outer side of the papillae anales, into the cleft between the upper and lower lobes (Figs. 27-32).

Glands removed from pinned specimens, cleaned with KOH and ethanol and examined by light microscopy and SEM (following critical-point drying) show the following structure. The outer surface is

covered with small regular pits (Fig. 27), which are presumably the bases of the inner structures. The inner surface is covered with regular polyplike structures (Fig. 28), consisting of a round, straight "trunk" topped with multiple small spinelike processes (Fig. 29).

The short ducts connecting the "accessory glands" to the outside of the body fuse with the outermost ventral portion of the bases of the apophyses posteriores (In *Acraga citrinopsis*, a lobe of the gland is fused with each apophysis, forming part of the inner wall of the apophysis [Fig. 242].) The ducts then empty into the cleft between the papillae anales (Figs. 30–32). Based on one observation of live *Dalcerina tijucana*, the glands appear to secrete a rapidly drying fluid onto the eggs as they are laid. This fluid completely covers the eggs and forms a smooth layer, which entraps loose scales and other debris as it dries (Fig. 1). The function of this layer is unknown—it could glue the eggs in place, strengthen the eggs, or protect the eggs from moisture loss or egg parasites. This layer appears to be thicker than that of most Lepidoptera eggs (see Downey and Allyn, 1981: 1–13).

The Epipyropidae have a single (not paired) gland that may be analogous or homologous (D. R. Davis, personal communication, 1986) to the glands of the Dalceridae. The Aidinae of Megalopygidae have glands that appear similar to those of Dalceridae, but they are less sclerotized and broadly connected to each other (thus lacking independent ducts to the outside). I have seen nothing similar in a limited sample of Limacodidae and other Megalopygidae.

The "Petersen's glands" of Zygaeninae (Bode and Naumann, 1988; Naumann, 1988) appear to not be homologous with dalcercid "accessory glands." I am not aware of similar "accessory glands" in any other Lepidoptera. The paired glands used in egg-laying in other Lepidoptera are usually connected to each other and/or the oviduct (e.g., Klots, 1970: 126). My use of

the term "accessory glands" does not imply homology to "accessory glands" as used in other Lepidoptera to designate "colleterial glands" or "glandulae sebaceae" or a variety of poorly identified structures.

In addition to the zygaenoid families already discussed, secondary accessory glands are present in females of various unrelated taxa of Ditrysian Lepidoptera, including Nymphalidae, Hesperidae, Noctuidae, and Geometridae (e.g., Bode and Naumann, 1988: 27–29; Burns, 1984: 21; Petersen, 1900: 100–102; Pierre, 1986; Urbahn, 1913: 339). However, dalcercid "accessory glands" differ from all these in having their external openings on the outside of the papillae anales (versus emptying into the genital tract or externally but between the papillae anales) and in the two members of the gland pair not being connected.

PHYLOGENETIC ANALYSIS

Phylogenetic analysis was undertaken to hypothesize the relationships among the genera of Dalceridae and to suggest the most appropriate generic placement of the species groups formerly placed in poorly diagnosed genera associated with *Acraga*. I chose to use cladistic methods because they are the most efficient for this type of study (Farris, 1980, 1983) and they standardize the reconstruction method, allowing future workers to test my results (Wiley, 1981). Cladistic procedures group taxa based on synapomorphies (shared derived character states), rather than overall similarity (Hennig, 1966).

Procedures

Terminal Taxa. The terminal taxa used were chosen in accord with the two purposes of the analysis (see the Introduction for discussion of generic and specific criteria used). In the Dalcerinae, genera were used as terminal taxa because the genera are well defined by both external and internal (genital) characters that provide clear apomorphies. Because it might rep-

resent a distinct genus, the *Minacraga aenea* species-group was included in the analysis, as well.

Due to paucity of external characters and apparent discordance of internal characters in species formerly placed in the genera *Acraga*, *Acragopsis*, *Anacraga*, *Dalargentina*, and *Dalcerides*, determination of appropriate generic limits was difficult. Therefore, all distinctive species groups (based primarily on male genitalia) were included in the analysis as terminal taxa. Thus, the phrase "terminal taxa" is used here to refer to both genera and distinctive species groups. The enigmatic genus *Zikanyrops* could not be included in the analysis because no males were available for study; it is probably near to or synonymous with *Dalcerides*.

Character Choice and Coding. The morphological characters to be coded were chosen, on the basis of the criteria discussed in the Introduction, as being appropriate to express relationships among genera or species groups. Some are simple presence or absence of a structure (e.g., frenulum); others, however, are three-dimensional shapes of complicated features, often of uncertain homology (e.g., sociuncus–tegumen complex, juxta-valval region). Optimal coding schemes for the latter kind of characters were hypothesized experimentally, using Transformation Series Analysis (TSA; see p. 320 and Mickevich, 1981, 1982; Mickevich and Weller, 1990; Mickevich and Lipscomb, 1991; Pogue and Mickevich, 1990; Lipscomb, 1990, for explanation).

Parallel data sets were prepared with features in question coded in several different ways. After completing TSA on each data set, the set with the highest character concordance was chosen as the optimal coding scheme. Character concordance (e.g., the best fit between that coding scheme and the rest of the data set) was measured by information content (e.g., resolution of the tree), transformational fits, and the equality of contribution to the cladogram across all characters (Micke-

vich and Lipscomb, 1991; Mickevich and Miller, in preparation). Only the coding schemes chosen as "best" are discussed here, and the details of this experimental approach will be published elsewhere (Mickevich and Miller, in preparation).

For example, the system of radial veins in the forewing was coded in parallel data sets as three characters (based on the individual branching points) and as one character (based on the overall pattern created by the branching). TSA of both data sets revealed that coding the radial system as one character was preferable to coding it as three characters. In more than 50 individual iterations on 20 data sets, similar experiments were made with the juxta-valval region (coding as one, two, or three characters), the gnathos (coding as one or two characters), and the sociuncus–tegumen complex (coding as one to four characters).

The great diversity in some characters of the male genitalia (especially the juxta-valval region and the sociuncus–tegumen complex) made it difficult to code character states to emphasize similarities (putative synapomorphies) rather than differences (autapomorphies for the various genera and species groups). In this study, I have excluded morphological features that vary within the terminal taxa. This was difficult, however, because the full range of variation within many terminal taxa is unknown due to lack of adequate material. The optimal coding schemes (chosen as already outlined) generally assessed the gross morphology of the largest appropriate region, rather than its component parts. For example, treating the entire sociuncus–tegumen complex as a unit emphasized similarities, while treating the various processes on different regions of the uncus separately emphasized differences.

As discussed by Weitzman and Fink (1985: 8–9), character choice is a subjective balance between describing perceived morphology and distinguishing evolutionary novelties. "A nonarbitrary way to di-

vide the functional and morphological attributes of an organism into subunits appropriate for phylogenetic studies has not yet been found, because of the functional and structural unity of the whole organism" (Weitzman and Fink, 1985: 8). An example of this problem is the juxta-valval region, which has evolved morphologically in several apparently independent ways to fulfill the general functional need for supporting the aedoeagus.

Methods. Data analysis utilized most parsimonious Wagner trees constructed by the PHYSYS program package (Farris and Mickevich, 1985), as installed at the University of Maryland, College Park, using discrete Wagner analysis with local and global branch swapping. The basic assumption of Wagner analysis is that the best estimate of phylogenetic relationships is that estimate which requires the fewest character transformations and is therefore the shortest possible cladogram (Farris *et al.*, 1970; Wiley, 1981). Unlike other algorithms such as Weighted Invariant Step Strategy (Farris *et al.*, 1970) or Dollo's model, which restrict the direction of character change, the Wagner method allows any possible change in order to minimize the number of ad hoc statements (i.e., extra steps) concerning character information.

Polarities of Transformation Series. Half of the final characters were polarized by outgroup comparison, which is the most reliable method (Maddison *et al.*, 1984; Stevens, 1980). The characters polarized directly by outgroup comparison are frenulum, forewing accessory cell, forewing anal loop, apical scale tuft on antennae, socii, and vinculum processes. No ontogenetic data are available, and none of the relevant families have a known fossil record (Carpenter, 1992).

However, due to the highly derived condition of many characters of Dalceridae relative to the rest of the Lepidoptera, only half the characters include states that are shared between the putative outgroups and the ingroup (Dalceridae). Another complication is the large number of states in

some of the multistate characters. These problems were addressed with TSA.

TSA is an iterative procedure that derives the most parsimonious interpretations of character change from successive cladograms, obtaining a better approximation with each iteration, until a final stable result is reached (Mickevich, 1981, 1982; Mickevich and Weller, 1990; Lipscomb, 1990; Pogue and Mickevich, 1990). The following example illustrates the use of TSA in a simple case. The first iteration of cladogram construction uses initial hypothesized transformation series, based on any available knowledge, or the transformation series may be unordered if necessary. The distribution of character states is plotted on the resultant cladogram and a simplified tree of states within each character is prepared, using Farris optimization and nearest neighbor associations (Mickevich, 1982: 462–466) to resolve ambiguous situations. The resultant character cladograms are reduced to transformation series that are used for the next iteration of cladogram construction. Character cladograms are again prepared from the next cladogram, and the process continues until both the cladogram and the transformation series stabilize. Mickevich (1982: 461) demonstrated that when TSA "gives results different from the original Wagner trees, the cladograms . . . [resulting from TSA] . . . show greater taxonomic congruence."

Outgroups. As discussed in the Introduction, the Epipyropidae, Limacodidae, and Megalopygidae appear to form a monophyletic group with the Dalceridae, but relationships among the four families are unknown. Use of these families as outgroups is hindered by three problems: the morphological diversity and homology of characters (especially of genitalia) of these families are poorly known; inability to choose a single sister group of the Dalceridae; and, most importantly, lack of shared character states (especially in genital structures) with the ingroup (Dalceridae). Lack of knowledge of the three families is a

serious problem that may lead to over-looking character states that are shared with Dalceridae. This problem, however, is beyond the scope of this revision. Inability to resolve relationships among the potential outgroups is probably the least serious problem, because either they all share the same state (some external characters) or none share a state with the ingroup (genital characters).

Most of the genital characters of Dalceridae are highly derived, and many are not known to occur elsewhere in the Lepidoptera (see the discussion under Morphology). Recognition of the homology of many structures (especially in the genitalia) within the family is difficult, so extending homologies for these structures to the other families is almost impossible with present knowledge. Most of these structures of questionable homology appear to have arisen in the Dalceridae via reduction and fusion and, in some cases have resulted in the creation of apparently new structures (e.g., juxta-valval region), although this would be difficult to confirm. I agree with Weitzman and Fink (1985: 10) that "when such losses are associated with new, complex, and unique similarities among related taxa, . . . a hypothesis of homology (i.e., synapomorphy) may be proposed and then analyzed for parsimonious correlation with other shared derived characters."

As already discussed, half the characters were polarized directly by outgroup comparison, and the other characters were polarized by TSA. Thus, outgroup comparison was used to root the cladogram and the cladogram was used to polarize the characters for which outgroup comparison was not available.

For this analysis, I have chosen Epipyropidae as an outgroup, because their morphological diversity is better understood than the much more species-rich Limacodidae and Megalopygidae, and because the monophyly of the Limacodidae and Megalopygidae has not been demonstrated. The only practical difference in using Limacodidae or Megalopygidae is that

these two families lack a forewing accessory cell, which makes no significant difference to the tree. Data for Epipyropidae have been taken from Heinrich (1931), Jordan (1928), Krampl and Dlabola (1983), Richards (1941), and D. R. Davis (personal communication, 1985).

Characters

The following are the final characters used, annotated listings of the states included, and the transformation series resulting from TSA on multistate characters. For detailed descriptions of the states, see the discussions of general morphology, genera, and illustrations. The transformation series derived from TSA are illustrated schematically for the six characters with more than three states. These transformation series are derived solely from the cladogram and are intended only as a hypothesis for further testing. The outgroup is designated as state A in the multistate characters. When more than one state is hypothesized to be derived from another state, each of these states is assumed to be independently derived (e.g., in the juxta-valval region, states H, I, J, and K are all considered to be derived independently from state B). Character states that are autapomorphic for terminal taxa were not deliberately included in the data set, although they are often included as unique states within characters included for other reasons. Females were excluded from the analysis due to incomplete data.

Wing Characters. Frenulum—Present or absent. *Forewing Radial System* (Fig. 33)—All radial veins free (A); R_1 free, $R_2 + R_3$ stalked, $R_4 + R_5$ stalked, R_{2+3} and R_{4+5} stems arising together (B); like B but R_{2+3} and R_{4+5} stems stalked (C); like B but R_{2+3} and R_{4+5} stems not arising together (D); R_1 arising together with R_{2+3} stem, R_{2+3} stalked, $R_4 + R_5$ stalked (E); R_1 free, R_{2+3} fused, R_{4+5} fused, R_{2+3} and R_{4+5} stems stalked (F); only two radial veins, apparently R_{1-3} fused, R_{4-5} fused (G); R_1 stalked with R_{2+3} stem, R_{2+3} fused, R_{4+5} fused (H). *Forewing Accessory Cell*—Present or ab-

sent. *Forewing Anal Loop*—Present or absent.

Head Character. Apical Scale Tuft on Antennae—Present or absent.

Genital Characters. Oval Pad Socii—Present or absent. *Juxta-Valval Region* (Fig. 34)—Normal valvae present (A); juxta fused complex partly surrounding and supporting aedoeagus, valval lobes dorsolateral of aedoeagus (B); juxta completely fused with vinculum, valvae tabs on vinculum (C); juxta unfused rod, valvae tabs (D); like G, but complex more strongly curved and sclerotized, encasing aedoeagus (E); like G, but complex less strongly sclerotized (F); juxta-valval complex forming sclerotized plate supporting aedoeagus, with weaker tube surrounding aedoeagus dorsally (G); external juxta rodlike, valval lobes partly or completely fused with base of juxta (H); juxta-valval complex around aedoeagus with hooklike valval tabs (I); juxta(?) conical complex encasing aedoeagus, valval lobes dorsolateral of aedoeagus (J); juxta-valval region very reduced (K). *Saccus* (Fig. 35)—Short, very broad (A); long, slender (B); reduced (C); short, slender (D); long, with bulbous apex (E); medium length, broad tapering to point (F); medium length, medium width (G); very reduced (H). *Aedoeagus* (Fig. 36)—Triangular (TRIANGULAR); long and slender (LONG); long and slender, end recurved (RECURVED); long with interior saclike (SAC); long and slender with exterior spine (SPINE); long with patch of cornuti on vesica or apex of aedoeagus (CORNUTI); medium length and stout (MEDIUM); reduced, encased in vinculum (ENCLOSED); long and slender, bent (BENT); internode hypothesized by TSA (?). *Gnathos* (Fig. 37)—Broad with ridges (A); unfused comblike (B); unfused triangular tabs (C); similar to C with strongly developed median process (D); developed as lateral arms (E); similar to C, but independent triangular tabs less well developed (F); fused (or near) into triangular plate (G); reduced unfused processes (H); single sclerotized ridged plate (I); like I

with strong lateral arms (J); thin fused plate, conforming to ventral surface of sociuncus (K); thin fused plate (L). *Sociuncus-Tegumen Complex* (Fig. 38)—Tegumen laterally extended, sociuncus reduced (A); elongate, with at most small points or lobes on uncus (B); globular, flattened, gently rounded (C); elongate, with long paired arms on uncus (D); globular (E); elongate, with lateral lobes on uncus (F); globular, with lobes (G); elongate, with dorsal hoods or lobes on uncus (H). *Process of Vinculum*—Absent, semicircular, or tusk- or bladeliike. Transformation series: ABSENT-CIRCULAR-TUSK.

Discussion of Cladogram

The cladogram indicating relationships among genera is presented in Figure 39. For simplicity, the cladogram of relationships among the species groups of *Acraga* is presented separately in Figure 40. For clarity of graphic presentation, the multistate characters are presented on the cladogram recoded as additive binary characters (Kluge and Farris, 1969), following the final transformation series obtained by TSA. Thus, the character states and transformation series already discussed under Characters are the same as those on the cladogram—they are just coded differently.

This cladogram shows excellent fit to the data set, with a total length of 61 steps. The minimum number of steps required for perfect fit would be 58 (number of steps for each character summed over all characters). The overall consistency index (Kluge and Farris, 1969: 7–8) is 95.082. The individual consistency indices for the characters are all 100, except aedoeagus (90.000), gnathos (91.667), and sociuncus-tegumen complex (87.500).

After the study was completed, the results were checked using the binary coded data set (Figs. 39, 40) in the HENNIG86 package (Farris, 1988). The HENNIG86 run resulted in one tree identical to Figures 39 and 40, with a length of 60 steps, a

consistency index of 95, and a retention index of 97.

The ensuing discussion treats only major clades. Apomorphies uniting other clades may be found on the cladogram. Character state changes on the terminal stems are discussed in the treatments of those taxa and will not be elaborated here. Autapomorphic states for terminal taxa were not deliberately included in the cladogram; those that are included are unique states within multistate characters included for other reasons. Some stems remain poorly defined and some nodes are not fully resolved, resulting in multifurcations. It must be emphasized that this is a preliminary estimate of the phylogeny of Dalceridae, and that (as with most neotropical organisms) the cladogram will change as new data are gathered for both Dalceridae (especially characters of females and immature stages) and its outgroup(s).

The branching points of the cladogram are defined by apomorphic character states. As used here, a state is apomorphic when it and all the states derived from it are unique to the group it defines. A monophyletic group "... shares an ancestral stem [character state] common only to members of that group" (Mickey, 1981: 212). Thus, all the taxa in a monophyletic group do not have to possess the apomorphic state that defines that group but must have either that state or a state uniquely derived from it.

Genera of Dalceridae (Fig. 39). The subfamily Dalcerinae is based on absence of the forewing accessory cell, gnathos shape H, and sociuncus–tegumen complex shape C. *Oroya* is quite different from other taxa of Dalcerinae and shares juxta-valval state B with *Acraga*. *Minacraga* and its aberrant *aenea* species-group are united by saccus shape F and tusklike vinculum processes. These two terminal taxa are clearly closest relatives and could be placed as one genus or as sister genera. Without further data, I prefer to retain them as the single genus *Minacraga*.

The subfamily Acraginae is based on

gnathos shape B. The association of gnathos shape B (apomorphic for *Dalcerides*) with *Acraga* rather than with Dalcerinae is weak, but several other characters corroborate the monophyly of Acraginae. Forewing radial pattern B, although placed in the analysis as an apomorphy for Dalceridae, is a synapomorphy for members of Acraginae. If the polarity of the forewing accessory cell is reversed by use of an alternate outgroup (as already discussed), then the presence of the accessory cell becomes a synapomorphy for members of Acraginae.

Dalcerides includes an unresolved multifurcation of four species-groups. Although this clade is based here only on juxta-valval shape I, gnathos shape B of Acraginae is a synapomorphy for members of *Dalcerides*. Relationships among the four species-groups used in the analysis (the species formerly included in *Dalcerides* [*sensu stricto*], the species formerly included in *Acragopsis*, *Dalcerides alba*, and *Dalcerides nana*) are unresolved, so they are not included on the cladogram. The only difference among them in the final character set is possession of the bent aedeagus shape by *D. alba*. The genus *Zikanyrops*, which could not be included in the analysis, probably belongs in or near *Dalcerides*.

Acraga, based on gnathos shape C and sociuncus–tegumen complex shape F, includes all the species-groups of Acraginae not placed in *Dalcerides*. The relationships of the species-groups of *Acraga* are discussed separately below.

Species-Groups of Acraga (Fig. 40). All these species-groups were previously placed in the poorly defined genera *Acraga*, *Anacraga*, and *Dalargentina*. Although some of the groups (e.g., *ampela* and *ochracea*) are clearly related, the relationships between most groups are weakly diagnosed. Although accumulation of further data may indicate that *Acraga* should be split into several genera, no strong groupings suitable for generic status are apparent in the cladogram. The relation-

ships among the species-groups of *Acraga* are based here only on five multistate characters (juxta-valval complex, aedoeagus, sociuncus-tegumen complex, saccus, and gnathos), which were polarized by TSA. Therefore, some of the included homologies and polarities are based on weak evidence. Further indication of the weakness of postulated relationships within *Acraga* is that many clades changed relationships in different experimental data sets (although the terminal pairings were generally the same), while the relationships among genera within Dalcerinae remained stable in all data sets. The basal unresolved quadrichotomy within *Acraga* exemplifies the difficulties in splitting *Acraga* into meaningful subunits. The *Acraga ciliata* group possesses many autapomorphic states, making its placement especially difficult.

Subfamilies. The subfamilies Dalcerinae and Acraginae were first separated by Orfila (1961), primarily on the basis of absence and presence, respectively, of the forewing accessory cell. Although these subfamilies have been weakened by analysis of characters that Orfila did not see (especially those of *Oroya*), the cladogram confirms the split of Dalceridae into two subfamilies, albeit weakly diagnosed (for further characters, see the discussions of the two subfamilies under Key to Genera).

A Test of the Stability of the Generic Phylogeny (Fig. 39A)

TSA was the sole means used to order transformation series for multistate characters (the forewing radial vein system as well as the complex genital characters: juxta-valval region, saccus, aedoeagus, gnathos, sociuncus-tegumen complex, and vinculum processes). For these multistate characters (with the exception vinculum processes), no direct outgroup information was available (although the tree constructed with TSA was polarized using an outgroup, in these genital characters the in-group generally did not share states with the outgroup).

While the relationships among species-groups within *Acraga* already postulated have no effect on nomenclature, the relationships and definitions of the genera are very important for the stability of dalcerid nomenclature. To test this, I removed the multistate genital characters from the data set and reanalyzed the remaining characters. This test is important to see whether TSA allowed maximal information extraction from the data or it produced results that are not concordant with the original data. Besides the important practical implications of this test, it has theoretical interest, as well. Is a phylogeny generated through a more conventional analysis (e.g., using only "traditional" characters with little or no use of TSA) concordant at the generic level with the phylogeny that used multistate genital characters ordered with TSA?

For the test, the multistate genital characters were removed from the data set. The remaining characters (frenulum, forewing radial system, forewing accessory cell, forewing anal loop, antennal tufts, and socii) were analyzed using PHYSYS. The same terminal taxa as in the full analysis were used (however, as in Fig. 39, species groups within *Acraga* and *Dalcerides* are not included in Fig. 39A for clarity).

The test data were analyzed in three ways, to evaluate the effects of ordering in the forewing radial system: (1) using the forewing radial system transformation series postulated by TSA (Fig. 33), (2) using the forewing radial system as unordered, and (3) applying TSA to the results of analysis 2. The results of the three analyses were similar, each producing either one (analyses 1 and 3) or two (analysis 2) trees of length 13, with consistency indices of either 92.308 (analysis 2) or 100 (analyses 1 and 3). All the trees had the same topology, except for one tree generated by analysis 2, which differed slightly in the placement of *Paracraga*. Only analysis 3, the stable result of new TSA on the forewing radial system, will be discussed further (as "test cladogram").

One further test was made to evaluate

the effect of outgroup choice. The data set from analysis I was used, reversing the polarity of the forewing cell (e.g., using Limacodidae or Megalopygidae as an outgroup). This analysis generated one tree with a length of 14, a consistency index of 92.857, and the same topology as the test cladogram.

The test cladogram (summarized in Fig. 39A) is concordant with the full cladogram (Fig. 39), but the test cladogram is less resolved. Because resolution of the species-groups within Acraginae (especially the species-groups of *Acraga*) is based on the five genital multistate characters, these cannot be resolved in the test cladogram. Likewise, as discussed previously, there are other conventional characters that support placement of *Acraga* and *Dalcerides* as monophyletic genera. The test data set does not include the apomorphies that resolve *Minacraga*, the *Minacraga aenea* group, and *Dalcerina*; however, the monophyly of *Minacraga* is evident from the tusklike processes of the vinculum (not included in the test data set, but included in Fig. 39A for clarity).

Thus, cladistic analysis of "traditional" characters of external morphology (socii of the genitalia were included in the test but show the same distribution as the forewing venation state C of Fig. 33) yields the same generic relationships as the analysis including multistate genital characters using TSA. The multistate genital characters, as ordered with TSA, allowed greater phylogenetic resolution within the groups of *Acraga* (Fig. 40).

BIOGEOGRAPHY

The following discussion attempts to draw preliminary conclusions about the ecological and historical biogeography of Dalceridae, via Holdridge Life Zones, current distribution patterns, and the composition of local faunas. Moths have great potential for use in biogeographic studies and also as indicators of environmental quality in areas undergoing rapid change in vegetation or climate (e.g., Holloway,

1983; Miller and Holloway, 1991), but such use requires a greater knowledge of distribution and biology than is currently available for Dalceridae.

Distribution by Life Zones

The ecological distribution of dalcerids is summarized according to the Holdridge Life Zone system, following the example of Becker (1982). This system has the advantages of being simple and readily available, because Life Zone maps are available for most neotropical countries (the important exception being Mexico). However, the system's application here is oversimplified. For instance, label data, especially for old collections, are sometimes vague or incorrect; because of this, and local ecological variation (e.g., gallery forest in savanna areas), specimens may have been collected in Life Zones different from those calculated from label data. In addition, the summaries include only Life Zones where a species has been collected, not all Life Zones where it may occur (i.e., many Life Zones have not been adequately sampled). However, the Life Zone system provides a good indication of where a species could be expected to occur.

My placement of localities in Life Zones follows Becker (1982), Tosi (1983), and references therein. I have seen published Life Zone maps (most cited by Tosi, 1983) for all relevant areas except Argentina, French Guiana, Guyana, Jamaica, Mexico, Surinam, Trinidad, and the United States (Arizona). Life Zones for northernmost Argentina and the Guianas were interpolated from maps of adjacent countries and climatic data. Life Zones for Arizona, Mexico, and Trinidad were calculated from climatic data (following Holdridge, 1978; Holdridge *et al.*, 1971). I follow Becker (1982) in citing localities such as Planaltina, Brazil, as "Tropical Premontane Moist Forest," and La Oroya, Peru, as "Tropical Premontane Wet Forest" rather than "Subtropical Moist Forest" (Tosi, 1983, etc.), because of their elevation.

Dalceridae have been recorded most

commonly (measured in species per Life Zone) from Tropical Moist and Tropical Premontane Wet Forest Life Zones, with fewer but significant numbers from Tropical Wet, Tropical Premontane Moist, Subtropical Moist and Wet, and Warm Temperate Moist Forest Life Zones. A few species are also recorded from Tropical Rain and Dry, Tropical Premontane Dry and Rain, Tropical Lower Montane Rain, Subtropical Dry, Subtropical Lower Montane Wet and Moist, and Warm Temperate Dry Forest Life Zones.

By examining the individual ecological components of the Life Zones (again by counting species per Life Zone), the following preliminary conclusions can be drawn (with the caveat that this may indicate more about the distribution of collectors than of moths and that marginal habitats are probably not adequately taken into account). Dalceridae are concentrated in the tropical and subtropical latitudinal regions, although a few species penetrate into the Warm Temperate region in Southeastern Brazil and adjacent areas. They occur primarily in the Basal and Premontane altitudinal belts, with some occurring in the Lower Montane belt and perhaps a few entering the Montane belt (Andean collecting localities are difficult to place accurately in Life Zones). Dalceridae occur mostly in the Moist and Wet humidity provinces, with some entering the Dry and Rain provinces (although the effect of local variations within Life Zones is hard to evaluate).

Dispersion and Dispersal

Although many species of Dalceridae are widely dispersed (*sensu* Platnick, 1976), their dispersal abilities appear to be limited. Some species range widely over most of tropical and subtropical South America, often occurring at elevations from sea level to over 1,000 m, even 1,500 m (e.g., *Acraga moorei*, *Dalcera abrasa*). Most species, however, appear to be more limited in distribution, and many are still known from very few localities. Dalcerids have been

relatively unsuccessful at colonizing areas south of Peru, Bolivia, and Brazil and north of Costa Rica and are not known at all in the Old World. Like Limacodidae and Megalopygidae, dalcerids are very poor at colonizing islands (Epstein and Miller, 1990), the only known island occurrence (excepting Trinidad and the Tres Mariás Islands) being the endemic species *Acraga ciliata* on Jamaica. Like many other neotropical insect groups (see Typical Neotropical Dispersal Pattern in Halffter, 1976), Dalceridae have not significantly penetrated the Mexican Plateau. While dalcerids appear to be generalists in habitat and foodplant choices, they are restricted by the limited mobility of the slug-like larvae and the short lifespan and poor flight abilities of the adults and perhaps also low population densities.

Geographical Distribution Patterns

Most dalcerid species fall into one of the following categories, although some species are known from too few localities to permit generalizations on their distribution, and several species fall into two categories:

1. Northern South America (to about the southern limit of the Amazon Basin), often extending north to Costa Rica.
2. Tropical and subtropical South America (to northernmost Argentina), often extending north to Costa Rica.
3. Andean-Guiana Shield Highlands, often following highlands into Costa Rica.
4. Southeastern Brazil and adjacent Argentina, Paraguay, and Uruguay.
5. Central America, with a few species penetrating north of southern Mexico and a few occurring in western Colombia and Ecuador.

Most of the genera (and species-groups in *Acraga*) are widely distributed in South America, below about 1,500 m. Only *Dalcerides*, *Paracraga*, and the *ciliata* and *infusa* groups of *Acraga* have penetrated north of Costa Rica; only *Dalcerides* has colonized north of Nayarit and Veracruz

in Mexico. Only *Dalcerina*, two species of *Dalcerides*, *Minonoa perbella*, *Zikanyrops sparsa*, and the *ferruginea*, *flava*, and *ochracea* groups of *Acraga* are restricted to southeastern Brazil and adjacent areas. The *ampela*, *hamata*, and *melinda* groups of *Acraga* are concentrated in highland areas of the Andes (up to 2,800 m for *A. mariala*) and Costa Rica and Panama, although they include species that occur in the Amazon Basin lowlands.

The Pleistocene refuge hypothesis has become very popular for explaining distributional patterns and areas of endemism in tropical forest organisms (see reviews by Beven *et al.*, 1984; Mayr and O'Hara, 1986; Prance, 1982; Salo, 1987; Whitmore and Prance, 1987). The available data suggest that the lowland dalcerid species are widely distributed, and there are not enough data on the species restricted to the Andes and Guiana Shield to evaluate patterns. Thus, due to lack of data, Dalceridae cannot yet be utilized to critically evaluate the refugia and centers-of-origin postulated (e.g., Beven *et al.*, 1984: fig. 1) by this model for biological diversification in the tropics.

Occurrence at Selected Sites

The combination of poor sampling in the neotropics in general and the rarity of dalcerids in collections means that the local resident dalcerid fauna is known for very few sites. I have selected nine localities that have been sampled fairly intensively for moths during most months over a period of years. This approach is biased by differences among collecting methods and sums species across years, ignoring possible local habitat changes. With the exception of Saint-Jean, the sampling apparently represents relatively small areas. Although these localities are among the best sampled for moths in the neotropics, many dalcerids are known only from one or several specimens per site—illustrating the paucity of our knowledge.

The sites are Turrialba (Costa Rica), Barro Colorado Island (Panama), Rancho

Grande (northern Venezuela), Kartabu (northern Guyana), Saint-Jean (northern French Guiana), Cerro de la Neblina Base-camp (0°50'N, 66°10'W, southern Venezuela), Planaltina (central Brazil), Nova Brémen (southeastern Brazil), and La Oroya (southern Peru). All numbers below count specimens of the *Acraga infusa* complex as one species (although several as yet unresolved species may be involved).

Each of these nine sites has between 6 and 12 dalcerid species, with an average of 8 species per site. A total of 40 species occur at the sites, but 25 of these are found only at one site. The 15 species that are common to several sites are *Acraga goes*, *A. leberna*, *A. moorei*, *A. ochracea*, *A. species* near *A. infusa*, *Dalceria abrasa*, *Dalcerides alba*, *D. dulciola*, *D. flavetta*, *D. mesoa*, *Dalcerina tijucana*, *Minacraga disconitens*, *Minacragides arnaxis*, *Paracraga argentea*, and *P. innocens*.

SYSTEMATIC TREATMENT

Family Dalceridae

Dalceridae Dyar, 1898: 231; 1910c: 113.—Hampson, 1898: 12, 16, 19.—Schaus, 1905: 331.—Kuznetsov, 1910: 881, 887; 1967: 8, 11, 18.—Dyar and Strand, 1913b: 27.—Forbes, 1914: 58; 1923: 99; 1942: 392.—Hopp, 1921: 276.—Eyer, 1924: 318, 322.—Comstock, 1925: 605.—Kaye and Lamont, 1927: 121.—Jordan, 1928: 137.—Heinrich, 1931: 3.—Sick, 1939: 1303.—Lima, 1945: 180.—D'Almeida, 1945: 193.—Duarte, 1947: 188.—Orfila, 1961: 249.—Munroe, 1970: 7.—Brock, 1971: 31, 51.—Watson and Whalley, 1975: 188.—Fletcher and Nye, 1982: ix.—Munroe, 1982: 632.—Davis, 1983: 67.—Holloway, 1986: 10.—Stehr and McFarland, 1987: 460.—Holloway *et al.*, 1987: 48, 139.—Scoble, 1992: 269–270.

Acragidae Hampson, 1918: 385, 390.

Dalcerinae [of Limacodidae] Janse, 1925b: 321, 335.—Handlirsch, 1925: 896.—Hopp, 1928a: 283.—Zerny and Beier, 1936: 1696.—Bourgogne, 1951: 393.—Remington, 1954: 234.

Dalcerinae [of Megalopygidae] Tams, 1935: 174.

Type Genus. *Dalceria* Herrich-Schäffer, [1854].

Diagnosis. Small to medium-sized, white, yellow, or orange (occasionally brown) ground-colored moths with no pro-

boscis and bipectinate antennae that taper evenly to the apex; distinguished from similar Limacodidae and Megalopygidae by the pairing of forewing veins R_2 with R_3 and R_4 with R_5 , as well as genitalia; some small orange Geometridae (especially *Eubaphe* Hübner) are superficially similar, differing in having narrow antennae and a prominent proboscis; some small whitish Lasiocampidae (especially *Nesara* Walker) are superficially similar, differing in the broadly expanded hindwing humeral angle and well-developed humeral vein.

Discussion. All the genera, and the species-groups within *Acraga*, are arranged below according to cladistic analysis. Within these groups, the species are grouped according to apparent relationships (but cladistic analysis of species has not been made).

Taxa Incorrectly Described as Dalcerae

The genus *Protacraga* and the four species listed below were originally described in Dalcerae and have been moved to other families by subsequent authors. I have seen the types of the four species and confirm the placements outside of Dalcerae.

Dalcera? *innoxia* Schaus, 1910: 415. Based on a female holotype (USNM), this species was transferred to the new genus *Coamorpha* Dyar (as type species) in Megalopygidae by Dyar and Strand (1913a: 14). It was also placed in Megalopygidae (without generic assignment) by Schaus (1915: 501). *Vescoa glutina* Schaus (1920: 146), based on males only, was synonymized by Hopp (1929: 44; 1935: 1077) under *Coamorpha innoxia*. However, I have seen a Costa Rican male (VOB collection 30946), which appears to be the true male of *innoxia* and suggests that *glutina* is not the male of *innoxia*.

Dalcera nigerella Dognin, 1923a: 24. Based on a male holotype (USNM), this species was transferred to *Protacraga* by Dyar (1927: 551). The genus *Protacraga* was transferred to Epipyropidae by Hopp (1928a: 284).

Protacraga micans Hopp, 1924: 553. Based on a holotype female (ZMHB), this genus and species was transferred to Epipyropidae by Hopp (1928a: 283).

Dalcera laxta Druce, 1890: 506. Transferred to *Nesara* in Lasiocampidae by Draudt (1928: 620) and Collier (1936: 93), this placement in *Nesara* appears to be correct, based on examination of the unique holotype in BMNH (in poor condition, without an abdomen); it is not a dalceraid.

KEY TO GENERA OF DALCERIDAE

1. Forewing without accessory cell (e.g., Fig. 55) (Dalcerae) 2
- Forewing with accessory cell (e.g., Fig. 41) (Acraginae) 9
- 2(1). Antenna with apical scale tufts; forewing R_4+R_5 stalked (e.g., Fig. 54); usually large, male forewing length ≥ 13 mm 3
- Antenna without apical scale tufts; forewing R_4+R_5 fused or stalked (e.g., Fig. 51); small, male forewing length ≤ 20 mm 5
- 3(2). Wings brown, bronze, or gold, usually metallic (Figs. 139–146) *Minacraga*
- Wings orange, never metallic 4
- 4(3). Forewing R_1 and R_{2+3} arising separately (Fig. 55); male forewing without submedial shading and curved inner half-band (Figs. 129, 131, 132) *Dalcera*
- Forewing R_1 and R_{2+3} arise together on short stalk from cell (Fig. 56); male forewing with submedial shading and curved inner half-band (Fig. 133) *Dalcera*
- 5(2). Wing ground color white or light brown, with brown pattern; male frenulum absent 6
- Wing ground color fuscous with multicolored pattern, or orange; male frenulum present 8
- 6(5). Wing ground color white or tan, forewing pattern brown or metallic (Figs. 117–124); forewing R_1 arises separately from R_{2+3} (Fig. 51) *Paracraga*
- Wing ground color light brown, not patterned (may have a few spots); forewing R_1 fused or stalked with R_{2+3} (Figs. 49, 52) 7
- 7(6). Forewing with 3 radial veins (Fig. 49); male forewing length ca. 9 mm *Minacragides*
- Forewing with only 2 radial veins (Fig. 52); male forewing length ca. 6 mm *Ca*
- 8(5). Wings fuscous with pattern (Figs. 125–128); forewing R_{2+3} fused (Fig. 53)

- *Minonoa*
 Wings orange (Fig. 150); forewing $R_2 + R_3$
 stalked, but not fused (Fig. 47) *Oroya*
 9(1). Forewing with accessory cell and es-
 pecially upper half of discal cell re-
 tracted, distal ends of cells not in line
 (e.g., Figs. 43, 44) *Dalcerides*
 Forewing cell normal, discal veins in line
 (e.g., Fig. 41) 10
 10(9). Forewing accessory cell large, at least half
 length of discal cell (e.g., Fig. 41) . *Acraga*
 Forewing accessory cell small, limited to
 apical tip of discal cell (Fig. 46)
 *Zikanyrops*

Subfamily Acraginae

Diagnosis. Distinguished from *Dalcerinae* by the presence of the forewing accessory cell (e.g., Figs. 41, 48).

Discussion. This subfamily includes *Acraga*, *Dalcerides*, and *Zikanyrops*. See Discussion of Cladogram for justification of subfamily status.

Acraga Walker

Acraga Walker, 1855a: 807.—Dyar, 1898: 232; 1910c: 115.—Dyar and Strand, 1913b: 28.—Sick, 1939: 1305.—Forbes, 1942: 393–394.—D’Almeida, 1945: 193.—Orfila, 1961: 255–256.—Fletcher and Nye, 1982: 3. Type species: *Acraga ciliata* Walker, 1855, by monotypy.

Aeruga [misspelling]. Pagenstecher, 1909: 439.

Pinconia Moore in Jones and Moore, 1882: 364.—Kirby, 1892: 543.—Druce, 1898: 441.—D’Almeida, 1945: 195.—Fletcher and Nye, 1982: 127. Type species: *Pinconia ochracea* Moore, 1882 [not Walker, 1855], by monotypy. [synonymized under *Acraga* by Dyar, 1898: 232]

Epipinconia Dyar, 1898: 231, 232.—Schaus, 1905: 331.—D’Almeida, 1945: 194.—Fletcher and Nye, 1982: 59. Type species: *Dalcera flava* Walker, 1855, by original designation. [synonymized under *Acraga* by Dyar, 1910c: 115]

Anacraga Dyar, 1905a: 176; 1910c: 119.—Dyar and Strand, 1913b: 29.—Hopp, 1921: 281.—Sick, 1939: 1307.—D’Almeida, 1945: 193.—Fletcher and Nye, 1982: 10. Type species: *Dalcera citrina* Schaus, 1896, by original designation. NEW SYN.

Dalargentina Orfila, 1961: 253–254.—Fletcher and Nye, 1982: 48. Type species: *Dalargentina sexquicentenaria* Orfila, 1961, by original designation. NEW SYN.

Diagnosis. Differs from *Dalcerides* in having forewing cell normal (discal veins in line) (e.g., Figs. 41, 42).

Adult Male. Small to large, forewing 7–

18 mm. Ground color: usually orange or yellow, some species white, several species brown or brownish red; some species with maculation. Forewing: Accessory cell present; R_1 free, arising from accessory cell; $R_2 + R_3$ long-stalked; $R_4 + R_5$ short-stalked; retinaculum present. Hindwing: R_s fused or not fused with $Sc + R_1$ in cell; frenulum present. Genitalia: Tegumen and sociuncus fused; sociuncus with various lateral lobes and posterior hooks and/or lobes; socii not distinct, but lobes of sociuncus usually hairy; gnathos various, central portion usually pair of unfused rectangular or triangular tabs, lateral arms sometimes present; vinculum slender, elongate; valvae reduced, fused into complex around aedoeagus, or lobes dorsolateral of complex; juxta not distinct, fused into complex surrounding and supporting aedoeagus (very strongly developed in some species); anellus probably present as complex surrounding aedoeagus; saccus slender, short to very long; aedoeagus various, medium length and stout to long and slender.

Adult Female. Medium to large, forewing 14–26 mm. Genitalia: Sterigma broad, often well sclerotized; ostium bursae narrow to broad; ductus bursae usually broad to first bend, then narrowing; corpus bursae spherical to elongate ovate; ductus seminalis arising between bends in ductus bursae; apophyses posteriores short to long, usually wide at base, narrowing to apex; “accessory glands” ovate or triangular in lateral view.

Discussion. Cladistic analysis shows that almost all the species previously placed in *Acraga*, *Anacraga*, and *Dalargentina* should be placed in *Acraga* (the few exceptions are transferred to *Dalcerides*). For convenience, I have organized *Acraga* into 11 species-groups. In most cases, all the species placed in a species-group are clearly both monophyletic and closely related, but placement of a few species (e.g., *Acraga perbrunnea*, *Acraga ria*) is problematic. These informal species-group names are for convenience only, and I do not intend them as the “interpolated species group

names" of the *International Code of Zoological Nomenclature* (ICZN, 1985, Article 6b).

Because the male holotype of *Acraga luteola* is lost, and *Acraga ingenesens* is known only from the female holotype without an associated male, proper assignment of these names is problematic, so I designate several species by letter only. Further material will be necessary to resolve the nomenclature and taxonomy of these lettered species.

The gender of *Acraga* Walker is taken to be feminine because its author described it with the included species *Acraga ciliata*.

To facilitate identification of species of *Acraga*, I provide two keys. The first is designed to sort all *Acraga* to species-group, but requires use of characters that may be difficult to see without dissection in some specimens. The second key is designed to sort immaculate orange and yellow *Acraga* to species or species-groups, using the shape of the sociuncus, which may usually be seen by gently brushing away the scales on a pinned specimen.

KEY TO SPECIES-GROUPS OF
MALE *ACRAGA*

(Note that to allow use of simple characters in the key, *Acraga chicana* [Mexico] and *Acraga neblina* [southern Venezuela] will key incorrectly to the *melinda* and *ciliata* groups, respectively.)

1. Wings orange with veins lighter or darker than ground color (Figs. 69, 70, 72) *ciliata* group 2
- Wings not as above 2
- 2(1). Wings white or pale yellow with pattern (Figs. 87-91, 115-116) *ampela* group 3
- Wings not as above 3
- 3(2). Hindwing Rs not fused with Sc+R₁ in discal cell (e.g., Fig. 41) 4
- Hindwing Rs fused with Sc+R₁ in discal cell (e.g., Fig. 42) 9
- 4(3). Forewings slightly falcate (e.g., Fig. 60) 5
- Forewings not falcate 8
- 5(4). Wings orange, orange-brown, or forewings brownish red with hindwings transparent yellow; highlands from Costa Rica to Peru, and the Amazon Basin *melinda* group

- Wings metallic yellow or brown; south-eastern Brazil and adjacent areas 6
- 6(5). Wings metallic yellow *flava* group (part)
- Wings brown or brownish red 7
- 7(6). Genitalia with single median posterior point on sociuncus (Fig. 158) *flava* group (part)
- Genitalia with no or 2 posterior points on sociuncus (Figs. 176, 177) *ferruginea* group
- 8(4). Aedoeagus very long, slender, flattened, and recurved externally (Figs. 157, 159-161); Central and South America *infusa* group
- Aedoeagus long and stout, pointed at apex (but not flattened), enclosed in strong spoutlike complex (Figs. 188-191); southeastern Brazil and adjacent areas *ochracea* group
- 9(3). Wings yellow; forewing length 14-17 mm; highlands of Costa Rica through the Andes *hamata* group
- Wings yellow or whitish; forewing length under 14 mm; Central and South America 10
- 10(9). Wings yellow or orange; sociuncus with single pair of adjacent strong posterior-directed downward-sloping points (Figs. 151, 152); Central and South America *goes* group
- Wings yellow or whitish; sociuncus points, if present, not as above; South America 11
- 11(10). Sociuncus with long points or processes (Figs. 175, 198) *citrina* group
- Sociuncus with only short points or genital lobes (Figs. 166-169) *concolor* group

KEY TO SPECIES-GROUPS OF IMMACULATE
YELLOW AND ORANGE MALE *ACRAGA*

(This key is designed for convenience in rough sorting specimens without dissecting genitalia. The characters used can be seen in most specimens by brushing the scales from the sociuncus. However, all identifications should be verified by comparison with the diagnoses and illustrations, including dissection if necessary. This key includes all *Acraga* with yellow or orange wings with no markings as well as a few other species that might appear similar if in poor condition. *Dalcerides nana* is also included, because it can easily be confused with *Acraga*; other species of *Dalcerides* as well as *Oroya aurora* may be easily separated by the forewing venation characters used in the key to genera.)

1. Sharp points or hooks arising laterally from sociuncus, one on each side (*infusa* group) 2
- Blunt or rounded points or lobes arising from middle or dorsum of sociuncus 3

- 2(1). Sharp points on sociuncus (Figs. 159, 161);
aedeagus long, flattened, and re-
curved at tip *infusa* group (part)
Elongate, curved hooks on sociuncus (Fig.
157); aedeagus long, relatively straight *ria*
- 3(1). Sociuncus with 1, 2, or 4 sharp central
points or tabular processes 4
Sociuncus with undulating lobes, points
short or absent, no tabular processes
(Figs. 166–168) *concolor* group
- 4(3). Sharp points on sociuncus 5
Tabular lobes directed dorsally from
dorsum of sociuncus (Figs. 170–173);
wings orange or orange-brown *melinda* group (part)
- 5(4). One central sharp point on sociuncus;
southeastern Brazil and adjacent coun-
tries 6
Two or 4 central sharp points on sociun-
cus; Central and South America 8
- 6(5). Wings metallic yellow; sociuncus as in
Figure 155 *flava*
Wings brownish or golden yellow, not
metallic 7
- 7(6). Wings brownish; sociuncus as in Figure
158 *obscura*
Wings golden yellow, with pale line along
end of forewing cell (often hardly vis-
ible); sociuncus as in Figure 202 *Dalcerides nana*
- 8(5). Four long, strongly downturned, sharp
central points on sociuncus (Fig. 175);
wings whitish with yellow tint; north-
ern South America *citrina*
Two sharp central points; orange, yellow,
or whitish 9
- 9(8). Sociuncus with dorsal hoods (Figs. 176,
188–191); aedeagus stout; wings or-
ange or red; southern Brazil, Uruguay,
Paraguay, and northern Argentina 10
Sociuncus relatively smoothly tapered
dorsally (Figs. 151–154, 174, 198); ae-
doeagus narrow; wings yellow or or-
ange; Central and South America 11
- 10(9). Sociuncus as in Figures 188–191; wings
orange; sociuncus often covered with
dense, long hairs *ochracea* group
Sociuncus as in Figure 176; wings brown-
ish rusty red; sociuncus covered with
normal hairs only *ferruginea*
- 11(9). Sociuncus with 2 simple central points,
sharp or rounded (Figs. 151–154);
wings yellow or orange 12
Sociuncus with 2 large semicircular dor-
sal processes; yellow; Colombia and
Ecuador *hoppiana*
- 12(11). Sociuncus as in Figures 151 and 152 *goes* group
Sociuncus as in Figures 153 and 154 *hamata* group

Acraga goes Species-Group

Diagnosis. Distinguished from other yellow or orange *Acraga* by single pair of adjacent strong posterior-directed downward-sloping points on sociuncus (Figs. 151, 152).

Adult Male. Medium size, forewing 9–11 mm. Ground color: yellow or orange. Hindwing Rs fused with Sc + R₁ in cell. Genitalia: tegumen and sociuncus fused, elongate; sociuncus with bluntly pointed downward-directed lateral lobe on each side; uncus with one pair of posterior points; gnathos rectangular tabs; vinculum thin, elongate; valvae fused into complex with juxta, maybe represented by lobes dorso-lateral of complex; juxta fused into complex with valvae; saccus slender, elongate; aedeagus long, slender.

Adult Female. Medium size, forewing 14–17 mm. Genitalia: sterigma medium width; ostium bursae narrow; ductus bursae long, narrow, recurved; corpus bursae elongate ovate; ductus seminalis arising at second bend of ductus bursa; apophyses posteriores broad, long, pointed or rounded; “accessory glands” ovate in lateral view.

Discussion. *Acraga goes* is a common species with distinctive genitalia. The other three species are only provisionally placed in this species-group: *Acraga ingenesens* is known only from the unique female holotype, the male holotype of *Acraga luteola* is lost, and *Acraga* new species F is known only from one male in poor condition.

KEY TO GOES GROUP MALES

- Wings yellow; paired sociuncus points touching (or almost) along entire length (Fig. 152); Central and South America; common *goes*
Wings orange (?); paired sociuncus points divergent from one another (not touching) (Fig. 151); Colombia; rare species F

Acraga goes Schaus, RESURRECTED COMB.

Figures 57, 152, 232; Map 1; Color Plate, Figure 15

Acraga goes Schaus, 1910: 415.

Anacraga goes:—Dyar and Strand, 1913b: 30.

Anacraga geos [sic]:—Sick, 1939: 1307.

Diagnosis. Distinguished from other yellow species by paired median points of sociuncus, which touch (or almost touch) each other along entire length (Fig. 152).

Adult Male (Fig. 57). Forewing length 9–11 mm.

Entirely light yellow. Forewing slightly darker than hindwing. Hindwing costal margin lighter than rest of hindwing. Genitalia as in Figure 152.

Adult Female. Forewing length 14–16 mm. Colored as in male, but anal angles of wings less produced. Genitalia as in Figure 232.

Type. Lectotype male, paralectotype male, here designated, USNM 11948.

Type Locality. Costa Rica, Guápiles, 850 feet [250 m].

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Year-round.

Distribution (Map 1). Costa Rica, Ecuador, Venezuela, Trinidad, Guyana, Surinam, French Guiana, Colombia, Peru, and Brazil, in Tropical Wet, Tropical Moist, Tropical Dry, Tropical Premontane Wet, Tropical Premontane Moist, and Subtropical Dry (Maricá) Forest Life Zones.

Material Examined. 227 males and 3 females. BRAZIL: *Amazonas*: Codajás, IV-1907, S. M. Klages (BMNH); Fonte Boa, V-VIII-1906, Klages (BMNH); São Paulo de Olivença, XI-XII-[no year], A. H. Fassl (USNM), [no date], Fassl (ZSBS); Hyatanahan [=Huitanaã], Rio Purus, II-III, VI-1922, Klages (CMNH, USNM); Monte Cristo, [no date], Fassl (USNM); Nova Olinda, Rio Purus, V-1922, Klages (CMNH); Tefé, IX-[no year], Fassl (USNM); Tonantins, XI-1921 (USNM); Amazon between Tefé and Tonantins, XI-1921 (USNM); *Bahia*: Ipaíú, I-1967, V. O. Becker (VOB); *Espírito Santo*: "Esp. Sto.," [no date] (ZSBS); *Goiás*: Ilha do Bananal, Rio Javare, 200 m, 4-8-IX-1977, 7-IX-1983, 14-18-IX-1985, Becker (VOB); *Pará*: Belém, 20 m, I-1984, Becker (VOB); Marabá, 50 m, 9-I-1977, Becker (VOB); *Pará* [=Belém], [no date], A. M. Moss (BMNH); Prainha, 14-XI-1873 (BMNH); Rio Xingu Camp, 52°22'W, 5°39'S, ca. 60 km S Altamira, P. J. Spangler & O. S. Flint (USNM); *Rio de Janeiro*: "Rio," [no date] (BMNH); 10 km SW Maricá, 11-12-X-1985, S. E. Miller & Becker (USNM); *Rondônia*: Calama, Rio Madeira, VIII-X-1907, W. Hoffmanns (BMNH); COLOMBIA: *Valle del Cauca*: Juntas, Río Dagua, 300 m, V-1909, Fassl (USNM); *Cauca*: Río

[San Juan de] Micay, [no date], W. Hopp (ZSBS); *Not located*: Cauca Valley, [no date], F. C. Nicholas (AMNH); COSTA RICA: "am [=on the slopes of Mount] Turrialba," I-VI-1929, F. Nevermann (ZSBS); Guápiles, 850 feet [250 m], [no date] (lectotype), VI-[no year] (paralectotype), XI-1909, W. Schaus (USNM); Hacienda La Suerte/Tapezco, 29 air km W Tortuguero, 40 m, 13-31-VIII-1979, Donahue *et al.* (LACM); Sirena, Corcovado National Park, 19-27-III-1981, 10-19-VIII-1980, D. H. Janzen & W. Hallwachs (USNM); Sixaola River, III-1909, Schaus (BMNH, USNM); Peninsula de Osa, 20 m, 15-XI-1972, Becker (VOB); Tuis, 2,500 feet [750 m], III-[no year], Schaus (BMNH); 1.8 miles [3 km] W Rincón, Osa Peninsula, 5-II-1971, J. P. Donahue & C. L. Hogue (LACM); Corcovado National Park, Osa Peninsula, 13-22-III-1980, Janzen & Hallwachs (USNM); 9.4 km W Bribri, Suretka, 200 m, 9-11-VI-1983, Janzen & Hallwachs (USNM); ECUADOR: Sarayacu, [no date], C. Buckley (BMNH) [locality may not be accurate]; FRENCH GUIANA: La Forestière, IV-[no year] (BMNH), VII-[no year] (ZSBS); Mana River, V-1917 (CMNH, USNM); Nouveau Chantier, II-[no year] (BMNH); Pied Saut, XII-1917, Klages (CMNH); Saint-Jean, IV-V-1904, Schaus (USNM), VII-VIII-1904 (BMNH), [no date] (BMNH, USNM); Saint-Laurent, I, II, IV, VI, VIII, X-XII-[various years] (BMNH, MNHP, USNM); 60 miles [100 km] up Maroni River, VIII-1904, Schaus (USNM); GUYANA: Kartabu, VI-1925 (CMNH), X-1920 (CU), [no date]-1920 (AMNH); MacKenzie, 24-VI-1927, [W. T. M. Forbes] (CU); Malali, [no date] (USNM); Moraballi Creek, Essequibo River, 2-XI-1929 (BMNH); Omai, VI-1908, Klages (BMNH); Rockstone, IX-1904, Schaus (USNM); Tumatumari, 28-29-VI-1927, [Forbes] (CU, USNM), XII-1907, Klages (BMNH); Takutu Mountains, 6°15'N, 59°5'W, 11-XII-1983, Spangler & W. E. Steiner (USNM); Wineperu, 18-24-III-1969, Duckworth & Dietz (USNM); PERU: *Loreto*: [Contamana], Middle Río Ucayali, 16-XI-1927, H. Bassler F6039 (AMNH); Río Ampiyacu, [no date] (BMNH); SURINAM: Aroewarwa Creek, Maroewym Valley, III-VI-1905, Klages (BMNH); Paramaribo, [no date] (USNM); TRINIDAD: Arima Valley, VIII-1906 (AMNH); Caparo, XI-1905, [no date], Klages (BMNH); Valencia Forest, 5-VIII-1981, M. J. W. Cock (MIJWC); VENEZUELA: *Amazonas*: Cerro de la Neblina Basecamp, 0°50'N, 66°9'44"W, 140 m, 4-12-II-1984, D. Davis & T. McCabe, 24-XI-1-XII-1984, R. L. Brown (USNM); Río Baria, 140 m, 0°55'N, 66°10'W, 25-XI-4-XII-1984, E. Osuna (UCV); San Pedro de Cataniapo, 100 m, 23-31-VIII-1981, J. L. Garcia (UCV); 6 km E San Carlos de Río Negro, 23-XI-1984, Brown (USNM); *Bolívar*: El Bochincbe Res. Forestal Imataca, 200 m, 16-18-V-1985, 6-13-XII-1974 (UCV); El Dorado to Santa Elena road, Km 88, 160 m, 28-IX-1967, C. J. Rosales (UCV); Río Surukum, Carretera Santa Elena Icabaru, 850 m, 19-31-I-1985, F. Fernandez Y. *et al.* (UCV); *Carabobo*: Las Quiguas, Esteban Valley, XI-III-[no year] (CMNH), 5-8-XI-1974, J. Salcedo (UCV); San Esteban, VI, VIII-1909, Klages (BMNH); Valencia, [no date] (BMNH); *Falcón*: Palma Sola, [no date]

(BMNH); Yaracal, 120 m, 1-VI-1982, J. A. Clavijo & A. Chacon (UCV); *Lara*: "Sanare and Baraquasimeto [sic], 6000 ft.," [no date] (BMNH); *Trujillo*: Valera, [no date], E. P. de Bellard (USNM).

Discussion. The female from the type locality is not mentioned in the original description, so it is not a paralectotype. The record of *Acraga goes* from Minas Gerais, Brazil (Hambleton and Forbes, 1935: 218) may refer to *Acraga citrinopsis*. *Acraga luteola* Hopp may be a synonym of *A. goes*, as discussed under *A. luteola*.

***Acraga ingenescens* (Dyar), NEW COMB.**
Figures 58, 231; Map 2

Anacraga ingenescens Dyar, 1927: 551.—Sick, 1939: 1308.

Diagnosis. Similar to *Acraga goes*, but apices and anal angles of wings more produced (Fig. 58).

Adult Male. Unknown.

Adult Female (Fig. 58). Forewing length 17 mm. Body rubbed, probably golden yellow. Forewing golden yellow. Hindwing pale yellow. Genitalia as in Figure 231.

Type. Holotype female, USNM 40716.

Type Locality. Venezuela, Mérida, "Terra temperee."

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Unknown.

Distribution (Map 2). Venezuela, probably in Tropical Lower Montane Moist Forest.

Discussion. Known only from the female holotype, which is in poor condition. This species is close to *Acraga goes*, but the wing angles are more produced and the female genitalia of *A. ingenescens* have a smaller corpus bursae, blunt-tipped apophyses posteriores, and more ovate "accessory glands" (the sterigma is damaged in the unique holotype).

***Acraga luteola* (Hopp), NEW COMB.**
Figure 59; Map 2

Anacraga luteola Hopp, 1921: 281.—Sick, 1939: 1308.

Adult Male (Fig. 59). Expanse 22 mm. **Head:** Yellow. **Thorax:** Yellow ochre.

Forewings golden yellow, the basal halves of the broad inner margin and the narrow costal margin bright yellow ochre. Hindwings a little paler but darker yellow at the anal angle. Ventral wings somewhat paler than dorsal. Legs yellow. **Abdomen:** Yellow ochre. Genitalia unknown.

Adult Female. Unknown.

Type. Holotype male, lost.

Type Locality. Brazil, Pará, [Belém].

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Unknown.

Distribution (Map 2). Northern Brazil (Amazon Basin), presumably collected in Tropical Moist Forest Life Zone.

Discussion. *Acraga luteola* was described from a single male collected by Sieber from "Pará," probably referring to Belém. The holotype is supposed to be in ZMHB, but it is not (H. J. Hannemann, personal communication, 1984). ZSBS has a poor-quality black and white photograph of the holotype, upon which my treatment is based. Dyar (1927: 551) treated *Acraga luteola* as a synonym of *A. ria* Dyar (without documentation), but the size and wing shape of the two disagree. I suspect that *A. luteola* is a synonym of *A. goes*, but I do not want to synonymize it formally without seeing the genitalia. The preceding color description is a translation of the original description.

***Acraga* new species F**
Figure 151; Map 2

Diagnosis. Similar to *Acraga goes*, differing in male genitalia (Fig. 151) and probably in coloration.

Adult Male. Forewing length ca. 9 mm. Single male rubbed and damaged by fungus. Body probably orange dorsally, pale yellow ventrally. Forewing orange. Hindwing pale yellow or whitish. Ventral wings pale yellow or whitish. Genitalia as in Figure 151.

Adult Female. Unknown.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. June.

Distribution (Map 2). Known only from Pacific slope of western Andes of Colombia.

Material Examined. 1 male. COLOMBIA: *Valle del Cauca*: "Naranjito," Río Dagua, 3,900 feet [1,200 m], VI-1908, [M. G. Palmer] (BMNH).

Discussion. Although the male genitalia are somewhat similar to *Oroya aurora*, this species appears to be most closely related to *Acraga goes*. The male genitalia of this species differ from those of *Acraga goes* as follows: paired points of sociuncus shorter and divergent (not touching); gnathos reduced; lateral saclike process on each side at sociuncus-tegumen articulation; and single hairy bulbous-ended process arising from vinculum under aedoeagus, protruding externally almost as far as aedoeagus. I refrain from naming this genitally distinctive species due to the poor condition of the single available specimen. The locality Naranjito has not been located.

Acraga hamata Species-Group

Diagnosis. Differs from *Acraga melinda* group and *Acraga flava* group in yellow coloration (Figs. 60–62), hindwing venation (Rs fused with Sc + R₁ in cell), and genitalia (see below and Figs. 153, 154, 156).

Adult Male. Medium size, forewing 14–17 mm. Ground color: yellow, without maculation. Forewing somewhat falcate. Hindwing Rs fused with Sc + R₁ in cell. Genitalia: tegumen and sociuncus fused, elongate; sociuncus with bluntly pointed downward-directed lateral lobe on each side; uncus with two median downwardly directed processes; gnathos rectangular tabs, as in *Acraga goes*; vinculum thin, elongate; long cylindrical complex (=anelus?) encasing aedoeagus; valvae reduced to lobes dorsolateral of cone; juxta not distinct; saccus slender, elongate; aedoeagus long, slender, slightly bent, with fine barbs on external end.

Adult Female. Medium size, forewing 19–21 mm. Genitalia: sterigma large, weakly sclerotized; ostium bursae broad,

saclike; ductus bursae short, medium width, recurved; corpus bursae spherical; ductus seminalis arising about middle of ductus bursae; apophyses posteriores broad, shallow, rounded; "accessory glands" ovate in lateral view.

KEY TO HAMATA GROUP MALES

Central America; genitalia as in Figure 153 *hamata*
South America; genitalia as in Figure 154 *andina*

Acraga hamata Schaus

Figures 60, 61, 153, 230; Map 3

Acraga hamata Schaus, 1910: 414.—Dyar and Strand, 1913b: 29.—Sick, 1939: 1306, pl. 168a.

Diagnosis. Similar to the sympatric *Acraga melinda*, but pale yellow, not deep orange; differing from the Andean *A. andina* only in male genitalia (Fig. 153).

Adult Male (Fig. 60). Forewing length 14–16 mm. *Head*: Yellow. *Thorax*: Dorsum deep yellow; venter pale yellow. Forewings somewhat falcate, slightly produced and rounded below M₃, bright light yellow. Hindwings incurved below apex, the anal angle produced, yellow (lighter than forewing) with costal margin whitish. Ventral wings pale yellow. Legs yellow. *Abdomen*: Pale yellow. Genitalia as in Figure 153.

Adult Female (Fig. 61). Forewing length 21 mm. Colored as in male, wings more rounded. Genitalia as in Figure 230.

Type. Lectotype male, 2 male paralectotypes, here designated, USNM 4947.

Type Locality. Costa Rica, Cartago, Juan Viñas.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. May to February.

Distribution (Map 3). Costa Rica, Panama, and maybe Colombia, in Tropical Premontane Wet and Rain Forest Life Zones.

Material Examined. 48 males and 1 female. COLOMBIA: "Colombia" [no further data], W. E. Pratt (MMU); COSTA RICA: Braulio Carrillo, 1,100 m, VII-1981, V. O. Becker (VOB); Cachí, VIII-X-1912, C. H. Lankester (BMNH); "Costa Rica," [no date], A. H. Fassl (ZSBS); Juan Viñas, [1,000 m], II, V-VI,

XI-[no year], W. Schaus & J. Barnes (USNM, including lectotype and paralectotype; BMNH); La Fuente, Turrialba, I-1940, A. Alfaro (USNM); La Montura, Braulio Carrillo Nat. Park, 1,100 m, 17-XII-1981, D. Janzen & W. Hallwachs (USNM); Monteverde, 1,400 m, 15-16-V-1980, Janzen & Hallwachs (USNM), 11-18-VIII-1976, E. M. Fisher (LACM), 15-IX-1982, C. Nagano & M. Hayes (LACM); Moravia de Chirripó, 1,000 m, 10-V-1983, Janzen & Hallwachs (USNM); Orosí, 1,200 m, [no date], Fassl (BMNH); Sitio, V-VI-[no year], Schaus (BMNH, CMNH, UMO, USNM); Tuis, 28-V-4-VI-[no year], Schaus & Barnes (BMNH, UMO, USNM); Volcán de Turrialba, 1,800 m, 13-VIII-1972, Becker (VOB); 3 km S Casa Mata, 16 km S San Isidro de Tejar, 1,800 m, 4-XII-1983, Janzen & Hallwachs (USNM); PANAMA: Lino, 800 m, [no date], Fassl (NHMV, USNM, ZSBS).

Discussion. *Acraga hamata* is apparently restricted to elevations above 800 m. The "Colombia" record probably refers to that portion of Colombia that is now Panama (see under *Acraga coa*).

***Acraga andina*, new species**
 Figures 62, 154, 229; Map 3

Diagnosis. Similar to the Central American *Acraga hamata*, differing in male genitalia (Fig. 154), especially uncus points and wider complex around aedoeagus.

Adult Male (Fig. 62). Forewing length 14-17 mm. Colored as in *Acraga hamata*, although forewing slightly darker. Genitalia as in Figure 154.

Adult Female. Forewing length 19 mm. Colored as in male, wings more rounded. Genitalia as in Figure 229.

Type. Holotype male, USNM 103444.

Type Locality. Peru, Huánuco, "near Leonpampa."

Host. Unknown.

Immature Stages. Unknown.

Flight Period. February, July, and December.

Distribution (Map 3). Andes of Venezuela, Colombia, Ecuador, and Peru, in Tropical Wet, Tropical Premontane Wet, Tropical Premontane Moist, and probably Tropical Montane Wet Forest Life Zones.

Material Examined. 10 males and 1 female. COLOMBIA: Guainía: "Ob. [upper] Río Negro," 800 m, [no date], A. H. Fassl (BMNH); ECUADOR: Tungurahua: Baños, 1,800-2,000 m, 10-VII-1936, W.

Clark-Macintyre (NHMV, 1 female); PERU: Huánuco: near Leonpampa, [no date], F. Woytkowski (USNM, holotype); Puno: Oconeque, 7,000 feet [2,100 m], VII-1904, G. R. Ockenden (BMNH, USNM, 4 paratypes); Santo Domingo, 6,500 feet [1,900 m], XII-1902, Ockenden (BMNH, paratype); VENEZUELA: Barinas: San Isidro, 14 km S La Soledad, 1,500 m, 30-31-V-1975, R. E. Dietz (UCV); Mérida: El Valle, 2,400 m, 15-16-II-1983, J. Demarmels *et al.* (UCV); Mucuy Fish Hatchery, 7 km E Tabay, 6,600 feet [2,000 m], 10-13-II-1978, J. B. Heppner (USNM).

Discussion. The species name refers to the Andes Mountains, where the species occurs.

The type series is restricted to the Peru specimens, because the other specimens vary slightly in male genitalia and might represent a different species. The Venezuela specimens vary in the sociuncus having the posterior points straight (not curved) and the lateral lobes differently curved (Fig. 156). The single Colombia male is like the Venezuela specimens, but the posterior points are somewhat longer.

If the males discussed here represent two species, then the identity of the single female is unknown (because there are no males known from Ecuador).

***Acraga flava* Species-Group**

Diagnosis. Species in southern Brazil and adjacent regions with forewings slightly falcate (Figs. 63-65), gnathos rectangular tabs, and aedoeagus encased in conical "anellus" (Figs. 155, 158).

Adult Male. Medium size, forewing 9-13 mm. Ground color: metallic yellow or brown, without maculation. Forewing somewhat falcate. Hindwing Rs not fused with Sc + R₁ in cell. Genitalia: tegumen and sociuncus fused, elongate; sociuncus with bluntly pointed downward-directed lateral lobe on each side; uncus with one median hooklike process; gnathos rectangular tabs, as in *Acraga goes*; vinculum thin, elongate; long conical complex (=anellus?) encasing aedoeagus; valvae lobes dorsolateral of cone; juxta not distinct; saccus slender, elongate; aedoeagus long, slender, bent, external end pointed.

Adult Female. Medium size, forewing

14–19 mm. Genitalia: sterigma broad; ostium bursae broad; ductus bursae wide to first bend, narrowing and recurved again to corpus bursae; corpus bursae spherical; ductus seminalis arising between bends; apophyses posteriores very short; “accessory glands” irregularly ovate in lateral view.

Discussion. The name *Epipinconia* Dyar, 1898 (type species: *Acraga flava*) is available for this group, although I prefer to regard it as an informal species-group only. *Epipinconia* was originally separated from *Acraga* on the basis of forewing $R_2 + R_3$ being coincident, but they are not completely fused. *Epipinconia* was synonymized under *Acraga* by Dyar (1910c: 115).

KEY TO FLAVA GROUP MALES

Wings metallic yellow (Fig. 63) *flava*
Wings dark brown to golden brown (Fig. 65)
..... *obscura*

Acraga flava (Walker)

Figures 63, 64, 155, 234; Map 4

Dalcera flava Walker, 1855b: 1107.—Kirby, 1892: 542.—Burmeister, 1879: 53, pl. XXIV, fig. 3.—Koehler, 1924: 25; 1928: 9.

Caviria sulphurea Burmeister, 1878: 517.—Kirby, 1892: 434. [synonymized by Burmeister, 1879: 53]
Epipinconia flava:—Dyar, 1898: 233.

Acraga flava:—Dyar, 1910c: 118.—Dyar and Strand, 1913b: 29.—Hopp, 1921: 280; 1928a: 284–286.—Sick, 1939: 1306, pl. 168e.—Duarte, 1947: 189.—Orfila, 1961: 249.—Biezanko, 1961a: 3; 1961b: 4.—Biezanko *et al.*, 1966: 5; 1974: 124; 1978: 57.—Ruffinelli Rey, 1967: 20.—Silva *et al.*, 1968: 295.

Diagnosis. Wings golden yellow with metallic luster; distinguished from *Dalcerides radians* by larger size, wing venation, and male genitalia (Fig. 155).

Adult Male (Fig. 63). Forewing length 12–13 mm. **Head:** Pale yellow. **Thorax:** Yellow. Forewings bright golden yellow with metallic luster; the scales patterned to appear as undulating transverse bands; very slightly falcate. Hindwings pale yellow. Ventral wings pale yellow. Legs pale yellow. **Abdomen:** Pale yellow. Genitalia as in Figure 155.

Adult Female (Fig. 64). Forewing length

14–19 mm. Colored as in male. Anal angles of wings less developed. Genitalia as in Figure 234.

Types. Holotype (?) male, BMNH (*flava*); lost? (*sulphurea*).

Type Localities. Brazil, Rio de Janeiro (*flava*); Argentina, Prov. Buenos Aires, Las Conchas [now Tigre] (*sulphurea*).

Hosts. *Nectandra* sp. (as “canellinha-busches”) (Lauraceae) (Hopp, 1928); *Psidium guajava* Linnaeus (Myrtaceae) (Biezanko, 1961a, 1961b; Biezanko *et al.*, 1966); *Prunus domestica* Linnaeus (Rosaceae) (Biezanko *et al.*, 1974: 124).

Immature Stages. Described by Burmeister (1879), Dyar (1910c), and Hopp (1928a).

Flight Period. Year-round.

Distribution (Map 4). Southern Brazil and northern Argentina, in Tropical Premontane Moist, Subtropical Wet, Subtropical Moist, Subtropical Lower Montane Wet, Subtropical Lower Montane Moist, and Warm Temperate Moist Forest Life Zones.

Material Examined. 46 males and 36 females. ARGENTINA: *Misiones*: Posadas, 26-IX-1921 (BMNH); BRAZIL: *Espírito Santo*: “Espírito Santo” (USNM); Santa Teresa, 400 m, 1920, F. H. Hoffmann (NHMV); Goiás: Vianópolis, XII-1931, R. Spitz (BMNH); Minas Gerais: Bergland um [=hilly country about] Ouro Preto, Fazenda Barcellos, 1,100–1,200 m, 10-14-IX-1952, H. Ebert (CMNH); “Capela Nova do Betim,” III-1916 (IOC); [Fazenda dos Campos, 1,500 m], reared from “canellino,” I-1921, J. F. Zikan (IOC); “Minas Geraes” [Fazenda dos Campos], I-1922, VI-1921, Zikan (BMNH); Nova Lima, 1-I-1985, V. O. Becker (VOB); “Passa Quatro” [Fazenda dos Campos], I-1921, II-1918, XII-1920, Zikan (ZSBS); Sete Lagoas, 720 m, 20-III-1968, Becker (VOB); *Paraná*: Banhado, Quatro Barras, 800 m, 26-III-1971, 30-X-1970, Becker & Laroca (VOB); Castro, [no date] (USNM), 950 m, [no date], E. D. Jones (BMNH); *Rio de Janeiro*: Cachoeiros de Macacu, 800 m, 15-X-1985, S. E. Miller & Becker (USNM); “Campo Bello” [Itatiaia, 400 m], II-1927, IX-1924, XII-1924, XII-1926, Zikan (ZSBS); Independência, Petrópolis, XII-1932, L. Travassos (IOC); [Itatiaia, 400 m], 23-II-1928, 28-II-1930, 8-IX-1934, 14-X-1927, 18-XII-1948, 22-XII-1924, Zikan (IOC); Maromba [1,100 m], Itatiaia, 28-VII-1952, Travassos (IOC); Nova Friburgo, [no date] (MNHP); Petrópolis, [no date] (BMNH, USNM), 13-X-1910, J. G. Foetterle (NHMV); “Prov. Rio” [Itatiaia, 400 m], Zikan (USNM); “Rio Janeiro,” [no date] (BMNH, probably Walker’s type); Teresópolis, [no date] (USNM), 13–22-III-1958,

H. B. D. Kettlewell (BMNH), 1,000 m, 15–16-I-1985, Becker (VOB); *Rio Grande do Sul*: Pelotas, 15-III-1966, Becker (VOB), 9-III-1953, 14-VI-1950, C. M. Biezanko (CU); Rio Grande do Sul, 1921, V. Wernicke (ZSBS); *Santa Catarina*: Hills between Hansa [=Corupá] and Jaraguá, 400 m, II-1935, A. Maller (BMNH); Jaraguá do Sul, VII-1935, Hoffmann (BMNH); Joinville, 7-VIII-1953, Biezanko (MCZ); Nova Teutonia, F. Plaumann (USNM); *Santa Catarina*, [no date] (BMNH); *São Paulo*: Ipiranga, 16-VII-1922, R. Spitz (NHMV); São Paulo, [no date], Jones (BMNH).

Discussion. Orfila (1961: 249) doubts the Argentina record of Burmeister (1878, 1879). Although Burmeister's locality, "Las Conchas," may be wrong, the country record is confirmed by a Misiones specimen (BMNH).

The type of *Caviria sulfurea* is lost, but based on the original description, the synonymy appears to be correct. The Burmeister collection is at MBR, but the type is apparently not there. "Under the heading of '*Dalcera flava* Wlkr., Buenos Aires,' handwritten by Burmeister himself, there are two specimens without any label, which we assume cannot be the types of *sulfurea*" (A. O. Bachmann, personal communication, 1986).

Acraga obscura (Schaus)

Figures 65, 158; Map 5

Dalcera obscura Schaus, 1896a: 57.—Dyar, 1898: 231. *Acraga obscura*:—Dyar, 1910c: 117.—Dyar and Strand, 1913b: 29.—Sick, 1939: 1306. "*Acraga obscura*: Biezanko, 1961a: 3.

Diagnosis. Similar to *Acraga meriden-sis* but darker; similar to *A. sexquicentaria*, differing in slightly falcate forewing (Fig. 65), and usually darker color and smaller size; differs from *A. ferruginea* and *A. brunnea* in median point of sociuncus (Fig. 158), size, and coloration.

Adult Male (Fig. 65). Forewing length 9–12 mm. **Head:** Tan with light brown antennae. **Thorax:** Dorsum brown, venter tan. Forewings dark to golden brown; slightly falcate. Hindwings golden brown, lighter than forewing, especially at costal margin. Ventral wings light brown except distal half of forewing and costal margin of hindwing, which are brown. Legs tan.

Abdomen: Dorsum light brown, venter tan. Genitalia as in Figure 158.

Adult Female. Unknown.

Type. Lectotype male, here designated, USNM 12550.

Type Locality. Brazil, São Paulo.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. January, March, May to July, October, and December.

Distribution (Map 5). Southern Brazil and Uruguay, in Warm Temperate Moist, Subtropical Wet, and Subtropical Moist Forest Life Zones.

Material Examined. 14 males. BRAZIL: *Paraná*: Antonina, 1,000 m, 21-I-1970, V. O. Becker (VOB); Curitiba, 920 m, 19-X-1974, Becker (VOB); *Rio Grande do Sul*: Pelotas, 9-III-1953, 14-III-1953, 20-V-1957, 4-VI-1958, C. Biezanko (CMNH, MCZ, USNM); "Rio Grande do Sul," [no date] (BMNH); *Santa Catarina*: Brusque, 28-XII-1969, Becker (VOB); Nova Teutonia, 2-VI-1963, F. Plaumann (MCZ), [no date], Plaumann (USNM); *São Paulo*: Ipiranga, 9-VII-1922, R. Spitz (NHMV); São Paulo, [no date], (USNM, lectotype); São Paulo, 2,300 feet [700 m], [no date], E. D. Jones (BMNH); URUGUAY: *Treinta y Tres*: Quebrada de los Cuervos, 16-XII-1952, C. S. Carbonell (MCZ).

Acraga infusa Species-Group

Diagnosis. Differs from other orange *Acraga* in male genitalia, especially sociuncus shape and narrow, elongate aedoeagus and saccus (Figs. 157, 159–161).

Adult Male. Medium size, forewing 9–14 mm. Ground color: orange, usually without maculation. Hindwing Rs not fused with Sc + R₁ in cell. Genitalia: tegumen and sociuncus fused, relatively compact, one strong pointed or hooked process on each dorsolateral, external, posterior surface of sociuncus; gnathos two unfused tabs, somewhat triangular in posterior view (not rectangular as in *Acraga flava* group), connected across bases; vinculum thin, elongate; valvae apparently lobes dorso-lateral of aedoeagus (developed into hooks in *Acraga ria* and arms in *A. serrata*); juxta fused into complex surrounding and supporting aedoeagus; saccus long and slen-

der; aedoeagus long, slender, flattened, and recurved externally.

Adult Female. Medium size, forewing 15–19 mm. Genitalia: sterigma broad and well sclerotized; ostium bursae broad; ductus bursae long and narrow, with two bends; corpus bursae elongate ovate; ductus seminalis arising from second bend in ductus bursae; apophyses posteriores medium length, wide at base, narrowing to apex; “accessory glands” ovate in lateral view.

KEY TO *INFUSA* GROUP MALES

1. Forewing concolorous orange (Figs. 67, 68, 75) 2
- Forewing deep orange with pale veins (Fig. 66) *neblina*
- 2(1). Forewing apex sharply angled (Fig. 75); genitalia with curved lateral hooks on sociuncus (Fig. 157) *ria*
- Forewing apex rounded (Figs. 67, 68); genitalia with only short points on sociuncus (Figs. 159, 161) 3
- 3(2). Apex of aedoeagus with serrate edges (Fig. 161); valvae developed as long arms arising dorsally from complex around aedoeagus (Fig. 161) *serrata*
- Apex of aedoeagus with smooth edges (Fig. 159); valvae not as above (Fig. 159) *infusa complex*

Acraga ria (Dyar), NEW COMB. Figures 75, 157; Map 6

Anacraga ria Dyar, 1910c: 119.—Dyar and Strand, 1913b: 30.—Sick, 1939: 1307, pl. 168b.

Diagnosis. Differs from other orange *Acraga* in forewing shape (Fig. 75) and male genitalia, especially hook (apparently valve) arising from each side of sociuncus (Fig. 157).

Adult Male (Fig. 75). Forewing length 8–10 mm. Entirely ochre yellow, with hindwings, abdomen, and ventral wings pale yellow. Forewing triangular, less rounded than most species. Genitalia as in Figure 157.

Adult Female. Unknown.

Type. Holotype male, USNM 13058.

Type Locality. Brazil, Rio de Janeiro.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. November to February.

Distribution (Map 6). Southern Brazil

and Peru, in Subtropical Moist Forest Life Zone.

Material Examined. 17 males. BRAZIL: *Rio de Janeiro*: [Itatiaia, 400 m], 17-I-1929, J. F. Zikan (IOC); “Rio Janeiro,” [no date] (USNM, holotype); *Santa Catarina*: Hansa Humbolt [=Corupá], XII-1932, A. Maller (BMNH); Nova Brémen, 250 m, 20-II-1937, F. Hoffmann (NHMV); PERU: *Madre de Dios*: Río Tambopata Reserve, 30 air km SW Puerto Maldonado, 290 m, 6–30-XI-1979, J. B. Heppner (FSCA, USNM).

Discussion. Holotype in very poor condition. Dyar and Strand (1913b: 30) recorded *Acraga ria* from Panama; I have seen no specimens to support this record and consider it a misidentification.

Acraga neblina, new species Figures 66, 160; Map 7

Diagnosis. Similar to *Acraga coa*, differing in more falcate forewing (Fig. 66) and male genitalia (Fig. 160).

Adult Male (Fig. 66). Forewing length 14–17 mm. Entirely light orange except dorsal forewing, which is deep orange with light orange veins. Genitalia as in Figure 160.

Adult Female. Unknown.

Type. Holotype male, USNM 103445.

Type Locality. Venezuela, Amazonas, Cerro de Neblina, Camp VII, 1,850 m, 0°51'N, 65°58'W.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. May, August, and December.

Distribution (Map 7). High altitudes of southern Venezuela, in Tropical Premon-tane(?) Wet and Tropical Lower Montane Rain Forest Life Zones.

Material Examined. 3 males. VENEZUELA: *Amazonas*: Cerro de Neblina, Camp VII, 1,850 m, 0°51'N, 65°58'W, 2–4-XII-1984, R. L. Brown (USNM, holotype); *Bolívar*: El Dorado to Santa Elena road, Km 155, 1,280 m, 19–21-V-1985, J. Clavijo & A. Chacon (UCV, paratype); Ptari-tepui, 30 miles [50 km] N Kavanayen, 1,800 m, 17–19-VIII-1970, R. E. Dietz IV (USNM, paratype).

Discussion. The species name is a noun in apposition.

Acraga serrata, new species

Figure 161; Map 7

Diagnosis. Differs from other orange *Acraga*, except *Acraga infusa* complex, in configuration of sociuncus (Fig. 161); differs from *Acraga infusa* complex in valvae developed as long arms arising dorsally from complex around aedoeagus and serrate edges of external end of aedoeagus (Fig. 161).

Adult Male. Forewing length 11–13 mm. Entirely orange. Dorsal hindwing slightly lighter colored than forewing. Ventral surfaces paler than dorsal surfaces. Genitalia as in Figure 161.

Adult Female. Unknown.

Type. Holotype male, USNM 103446.

Type Locality. Brazil, Amazonas, Tefé.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. January, September, November, and December.

Distribution (Map 7). Amazon Basin in Brazil and Peru, in Tropical Moist Forest Life Zone.

Material Examined. 5 males. BRAZIL: Amazonas: Hyutanahan [now Huitanaã], Rio Purus, 1-1922, S. M. Klages (CMNH, paratype); São Paulo de Olivença, XI-XII-[no year], A. H. Fassl (USNM, paratypes); Tefé, IX-[no year], Fassl (USNM, holotype); PERU: Loreto: Callicebus Research Station, Mishana, Rio Nanay, 25 km SW Iquitos, 120 m, 10-17-I-1980, J. B. Heppner (USNM, paratype).

Discussion. Although this species is very close to the *Acraga infusa* complex, I am describing it now because the male genitalia are so distinctive, and particularly because the form of the apparent valvae provides clues to the homology of the valvae of related species. I have seen many specimens in the *A. infusa* complex from the Amazon Basin but have found only five specimens of this species. The species name refers to the edges of the apex of the aedoeagus, which are toothed like a saw.

Acraga infusa complex

Figures 67, 68, 159, 236

Diagnosis. Differs from other orange *Acraga* in male genitalia, especially so-

ciuncus and narrow, elongate aedoeagus and saccus (Fig. 159).

This may represent one variable species or could be a complex of closely related species, but resolution of the problem is beyond the scope of the present work. All the specimens are entirely orange (paler ventrally), varying considerably in size and somewhat in apparent wing shape and color tone (perhaps due to wear) (Figs. 67, 68). The male genitalia are alike except for the configuration of the structures around the aedoeagus (juxta and valvae) and extreme variation in the length of the saccus and aedoeagus, from medium length (for a dalcetid) to very long (almost the length of the abdomen). Further analysis of the variation in length is necessary.

Three names are available: *Acraga infusa* Schaus (1905: 332), *A. philetera* (Schaus, 1910: 415), and *A. conda* Dyar (1910c: 116). Lectotypes need to be designated for the latter two. Literature records cannot be trusted, because this complex has been frequently misidentified as *Acraga ochracea*.

I have seen specimens in this complex from Guatemala, Belize, Costa Rica, Panama, Colombia, Venezuela, Trinidad, Guyana, Surinam, French Guiana, Ecuador, Brazil, Peru, Bolivia, and Paraguay.

Acraga ciliata Species-Group

Diagnosis. Orange species with the wing veins lighter (Figs. 72, 73) or darker (Figs. 69–71) than ground color (except *Acraga chicana*; Fig. 74), and recurved structure encasing aedoeagus (Figs. 162–165).

Adult Male. Medium to large, forewing 10–18 mm. Ground color: orange with veins distinctly lighter or darker than ground color (except *Acraga chicana*, which has concolorous veins). Hindwing Rs not fused with Sc + R₁ in cell. Genitalia: tegumen and sociuncus fused, somewhat globose, posterior end developed as lateral lobes with split between them, paired lateral lobes along sides also; gnathos two elongate rectangular processes fused at base, adjacent but free above base; vin-

culum slender, elongate, extended, forming loop, encasing aedoeagus—very narrow at articulation with tegumen-sociuncus, membranous portion connecting overlapping distal and proximal sclerotized portions (in vicinity of aedoeagus opening), proximal portion very elongate to saccus, where vinculum fuses into one structure, which turns sharply to become posterior-directed, ending externally, with long narrow spines on apex; valvae and juxta not identified; saccus presumably small saclike process at bend in vinculum; aedoeagus very slender elongate tube, encased in recurved portion of vinculum, free of vinculum only at ends.

Adult Female. Medium to large, forewing 14–26 mm. Genitalia: sterigma broad; ostium bursae narrow; ductus bursae broadened near outlet, remainder narrow; corpus bursae ovate; ductus seminalis arising from ductus bursae midway between broadened section and corpus bursae; apophyses posteriores narrow, long; “accessory glands” triangular in lateral view.

Discussion. This group contains four species that are different from all other dalerids in coloration and male genitalia. The recurved structure that encases the aedoeagus is apparently unique among Lepidoptera; this structure is probably the vinculum (as already described) but may include the fused valvae and juxta.

KEY TO *CILIATA* GROUP MALES

- | | | |
|-------|---|----------------|
| 1. | Forewing veins darker than ground color (Figs. 69, 70) | 2 |
| | Forewing veins lighter than or same color as ground color (Figs. 72, 74); Central America | 3 |
| 2(1). | Larger, forewing 15–18 mm; South America | <i>moorei</i> |
| | Smaller, forewing 10–11 mm; Jamaica | <i>ciliata</i> |
| 3(1). | Forewing veins lighter than ground color (Fig. 72) | <i>coa</i> |
| | Forewing veins same color as ground color (Fig. 74) | <i>chicana</i> |

Acraga ciliata Walker

Figures 41, 69, 162, 233; Map 8;
Color Plate, Figure 16

Acraga ciliata Walker, 1855a: 807.—Kirby, 1892: 542.—Dyar, 1898: 232; 1910c: 116–117.—Dyar and Strand, 1913b: 28.—Sick, 1939: 1305.

Diagnosis. Jamaican species similar to *Acraga moorei* but much smaller; somewhat similar to *A. infusa*, but the wing veins are darkened (Fig. 69) and genitalia have a looped vinculum encasing aedoeagus (Fig. 162).

Adult Male (Fig. 69). Forewing length 9.5–12 mm. *Head:* Pale luteous. *Thorax:* Pale luteous. Forewings pale luteous, darker along veins, especially at end of cell, and along outer and inner margins. Hindwings pale luteous, slightly lighter than forewing. Ventral wings pale luteous. Legs pale luteous. *Abdomen:* Pale luteous. Genitalia as in Figure 162.

Adult Female. Forewing length 14 mm. Colored as in male. Genitalia as in Figure 233.

Type. Holotype female [not male as stated in original description], BMNH.

Type Locality. Jamaica.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Year-round.

Distribution (Map 8). Jamaica, widely distributed through many habitats from rather dry to wet, and sea level to 1,300 m.

Material Examined. 41 males and 1 female. JAMAICA: “Jamaica,” [no date] (BMNH, CMNH, USNM), [1844–1846], E. H. Gosse (BMNH, holotype), [no date], Taylor (BMNH); Baron Hill, X-1931, L. Perkins (CMNH); Claremont, 10-V, 8-VI-1936, Perkins (CMNH), 1955, B. Heineman (AMNH); Clarendon, about 3,000 feet [ca. 900 m], 15–18-XII-1919 (AMNH); Falmouth, 19-VII-1960, C. & P. Vaurie (AMNH); Hardwar Gap, I-1937, IV, VI, VIII-1936, VIII-1938, IX-1939, X-1934, XII-1933, E. Paine (CMNH); Highgate, 25-VII-1936, A. Avinoff & N. Shoumatoff (CMNH); Mandeville, 2,000 feet [600 m], 13-IV-1937, Avinoff & Shoumatoff (CMNH); Port Antonio, 4-I-1959, 3-II-1962, 16-II-1961, Heineman (AMNH), 21-III-1957, S. A. Hessel (PMY); 1 mile [1.6 km] N Hardwar Gap, 12–20-XI-1966, E. L. Todd (USNM, BMNH); 4 miles [6.5 km] S Hartford, 850 feet [250 m], 26–27-IV-1973, D. & M. Davis (USNM); 3.2 miles [5 km] NE Kellits, near Pedro River, 1,600 feet [480 m], 18-IV-1973, Davis (USNM).

Discussion. This species is endemic to Jamaica and is the only dalerid known from the West Indies (excluding Trinidad). It is not uncommon among insects for families to be represented in the West

Indies only by Jamaican endemics (Buskirk, 1985). No dependable Life Zone map is available for Jamaica (G. R. Proctor, personal communication, 1986).

Acraga moorei Dyar

Figures 4–6, 70, 71, 163, 235; Map 9

Pinconia ochracea Moore in Jones and Moore, 1882: 364–365.—Jones in Jones and Moore, 1882: 365.—Kirby, 1892: 543.—Holloway, 1986: 9, fig. 13. [pre-occupied by *Acraga ochracea* Walker, 1855]

Acraga moorei Dyar, 1898: 232; 1910c: 116.—Dyar and Strand, 1913b: 28.—Handlirsch, 1925: 896.—Sick, 1939: 1305, pl. 168d.—Orfila, 1961: 257–258, figs. 7, 8, pl. 1, figs. 5, 6.—Silva *et al.*, 1968: 295.—Scoble, 1992: 349, fig. 248.

Diagnosis. Readily distinguished by dark forewing veins (Fig. 70); *Acraga coa* is similar but has light veins.

Adult Male (Fig. 70). Forewing length 15–18 mm. **Head:** Ochreous. **Thorax:** Ochreous. Forewings ochreous with veins (except costa) dark. Hindwings ochreous, slightly brighter than forewings, veins slightly darkened near margins. Ventral wings ochreous. Legs ochreous. **Abdomen:** Ochreous. Genitalia as in Figure 163.

Adult Female (Fig. 71). Forewing length 23–26 mm. Colored as in male. Genitalia as in Figure 235.

Types. Two male syntypes, apparently destroyed during World War II in a fire at MCML (I. D. Wallace, personal communication, 1982).

Type Locality. Brazil, São Paulo.

Hosts. *Eriobotrya japonica* (Thunberg) Lindley (Rosaceae) (Jones in Jones and Moore, 1882); *Coffea arabica* Linnaeus (Rubiaceae) (Silva *et al.*, 1968: 295 and CPAC).

Immature Stages. Discussed by Jones in Jones and Moore (1882).

Flight Period. Year-round.

Distribution (Map 9). Venezuela, Colombia, Brazil, Ecuador, Peru, Bolivia, Paraguay, and northern Argentina. Recorded from Tropical Wet, Tropical Moist, Tropical Premontane Wet, Tropical Premontane Moist, Tropical Lower Montane Wet, Tropical Lower Montane Moist, Subtropical Wet, Subtropical Moist, Subtrop-

ical Lower Montane Moist, Subtropical (Lower?) Montane Wet or Rain, and Warm Temperate Moist Forest Life Zones.

Material Examined. 137 males and 37 females. ARGENTINA: *Misiones:* Misiones, [no date], P. Koehler (ZSBS); *Salta:* San Andrés, Río Zenta, 31-V-1935, J. P. de Verteuil (BMNH); BOLIVIA: *Cochabamba:* Cochabamba, [no date], J. Steinbach (CMNH); Incachaca, [no date], Steinbach (USNM); Yungas de Incachaca, 2,100 m, 10-II-1959, R. Zischka (ZSBS); *La Paz:* Yungas de Coroico, 1,900 m, 18-V-1950, W. Forster (ZSBS); Río Zongo, 750 m, [no date], A. H. Fassl (BMNH, NHMV, USNM, ZSBS); BRAZIL: *Distrito Federal:* Brasília Airport, 23-III-1972, Munroes (CNC); Planaltina, 1,000 m, 18-III-1977, 20-III-1982, 2-IV-1976, V. O. Becker (VOB, CPAC), 5-VIII-1978, Santos (CPAC), larva on coffee, 21-VI-1985, pupated 15-VII-1985, emerged 2-VIII-1985, C. Braga (CPAC); *Goiás:* Leopoldo de Bulhões, XII-1933, R. Spitz (BMNH); 20 km N São João da Aliança, 15-IV-1956, F. S. Truxal (LACM); *Mato Grosso do Sul:* Salobra, 1-9-III-1940 (IOC); *Minas Gerais:* [Fazenda dos Campos, 1,500 m], 27-V-1920, J. F. Zikan (IOC); [Passa Quatro, 950 m], 18-V-1922, Zikan (IOC); Sete Lagoas, 720 m, 14-III-1974, Becker (VOB); Teófilo Otoni, Rio São Jacinto, XII-1907, F. Birch (BMNH); *Paraná:* Castro, [no date], E. D. Jones (BMNH); Curitiba, 920 m, 28-XII-1974, 27-28-IV-1975, 10-I-1975, Becker (VOB); Guarapuava, II-1950, F. Justus (CU); Iguaçu, 25-XI-1921 (BMNH); *Rio de Janeiro:* "Campo Bello" [Itatiaia, 400 m], III-1927, IV, XII-1926 (ZSBS), 19-V-1933, 21-VI-1928, 6-XII-1926, 6-XII-1933, 17-XII-1935, 17-XII-1937, Zikan (IOC); Itatiaia, 12-IX-1933, Travassos & H. S. Lopes (IOC), 800 m, 20-IV-1965, H. Ebert (ZSBS), 800–1,200 m, 31-III-1965, Ebert (ZSBS); [probably] Nova Friburgo, I-1913, J. Arp (USNM); *Santa Catarina:* Blumenau, [no date] (MCZ); "Joinville?", [no date], E. & A. Boettcher (ZSBS); Nova Brémen, Rio Laeiss, IV-1936, F. H. Hoffmann (BMNH); Rio Vermelho, near São Bento, 850 m, IV-1936, A. Maller (NHMV); Santa Catarina, IV-1922, E. D. Jones (LACM); *São Paulo:* Alto da Serra, I, III, VI–VIII, XI–XII, 1922–1929, Spitz (BMNH); Boracéia, Salesópolis, 22-V-1947, Travassos (IOC); Cantareira, I-1920, Pohl (USNM); "Faxina," [no date] (ZSBS); Ipiranga, I-1926, III-1923, Spitz (BMNH); Mato do Governo, I, IV-1921, XII-1920, Pohl (ZSBS); São Paulo, [no date] (BMNH, USNM, ZSBS), [no date], Von Ithering (USNM), Pohl (CMNH), IV-1917, V-1918 (ZSBS); São Paulo, 750 m, IV-1913, Jones (BMNH); COLOMBIA: *Antioquia:* Medellín, La Estrella, 1,700 m, II-1960, P. B. Schneble (ZSBS); *Cauca:* Popayán, 1897 (USNM), [no date], W. Hopp (ZSBS), [no date], Lehmann (BMNH); *Cundinamarca:* Monterredondo, 1,420 m, 24-IX-1961, Schneble, 2-IV-1961, J. Foerster (ZSBS); *Guainía:* Ob. [=Upper] Río Negro, 800 m, [no date], Fassl (BMNH); *Valle del Cauca:* San Antonio, 1,800 m, VI-1909, Fassl (USNM); 4 km NW San Antonio, 6,500 feet [2,000 m], 15-IV-1958, 5-I-1959, A. H. Miller (UCB); Ulloa, "4-II-1976," R. Car-

denas, reared from coffee foliage (USNM); *Not located*: "Colombie," [no date], Reigner (BMNH); EC-UADOR: *Imbabura*: "Otavalo/Apuela," 2,200 m, 8-9-IX-1977, L. E. Peña G. (LACM); *Pastaza*: La Victoria, Río Pastaza, 3,500 feet [1,000 m], [no date], M. G. Palmer (BMNH); *Tungurahua*: El Rosario, Río Pastaza, 4,900 feet [1,500 m], [no date], Palmer (BMNH); PARAGUAY: "Paraguay," [no date], C. Jorgensen (ZMUC), "Dr. Bohls" (BMNH); *Guairá*: Villarrica, 24-V-1921, Jorgensen (USNM), 15-III-1938, O. Kaeser (BMNH), I, III, IX, XII-1922-1924, F. Schade (BMNH), "4/2 1926 . . . Modt. 2/10 1926 af," Schade (ZMUC), [no date], Jorgensen (BMNH); *Paraguayá*: Sapucaí, XI-1901, XI-1903, W. Foster (BMNH); PERU: *Cajamarca*: Hacienda Taulis, III-1955, N. Bismarck (ZSBS); *Madre de Dios*: Avispas, 400 m, 20-30-IX-1962, L. Pena (CNC); *Pasco*: Huanacabamba, Cerro de Pasco, 6,000-10,000 feet [1,800-3,000 m], E. Boettger (BMNH); *Puno*: La Oroya, Río Inambari, 3,000 feet [900 m], V-1905, G. R. Ockenden (USNM), XI-XII-1905, X-1904, Ockenden (BMNH); Oconeque, 7,000 feet [2,100 m], VII-1904, Ockenden (BMNH); Quintun, 5,000 feet [1,500 m], I-1905, Ockenden (BMNH); Río Huacamayo, 3,100 feet [900 m], VI-1904, Ockenden (BMNH); Santo Domingo, 6,000 feet [1,800 m], XI-1904, XII-1901, Ockenden, 6,500 feet [2,000 m], XII-1902, Ockenden (BMNH); VENEZUELA: *Aragua*: La Victoria, 1,700 m, VII-VIII-1963, XII-1961, W. Gatz (ZSBS); Rancho Grande, 1,100 m, 15-VII-31-VIII-1967, R. W. Poole, 1-20-I-1978, J. B. Heppner (USNM), 23-VII-1946, 2-IX-1946 (AMNH), [no date], Vogelsang (ZSBS), VI-VII-1974, A. Watson (BMNH), 16-XI-1955, F. Fernandez Y. (UCV); *Distrito Federal*: Los Venados, Caracas, [no date], P. C. Vogl (ZSBS); *Lara*: Parque Nacional Yacambú, 6-8-IV-1981, A. S. Menke & L. Hollenberg (USNM).

Discussion. I have seen one male (ZSBS), which was once sold by a dealer, labeled Orizaba, Mexico; I consider it mislabeled.

Acraga coa (Schaus)

Figures 27-32, 72, 73,
164, 237; Map 8

Pinconia coa Schaus, 1892: 322.—Druce, 1898: 441, pl. LXXXVII, fig. 23.—Holland, 1903: 369-370, pl. VIII, fig. 6.—Comstock, 1925: 606.

Acraga coa:—Dyar, 1898: 232; 1910c: 116; 1914: 252; 1925b: 44-46.—Dyar and Strand, 1913b: 28.—Hoffmann, 1933: 295.—Sick, 1939: 1305, pl. 168d.—Forbes, 1942: 394.—Schröder, 1963: 493.—Stehr and McFarland, 1985: 36; 1987: 460.—Beutelspacher, 1992: 144.—Miller, 1993: 180, figs. 2-5.

Acraga moribunda Schaus, 1920: 150.—Sick, 1939: 1307. NEW SYN.

Acraga canaquitam Dyar, 1925a: 18.—Sick, 1939: 1305. [synonymized under *coa* by Dyar, 1925b: 44]

Diagnosis. Distinguished from all other orange dalcerids (except *Acraga neblina*) by wing veins lighter than ground color (Fig. 72); differs from *A. neblina* in more rounded wings (Fig. 72) and male genitalia (Fig. 164).

Adult Male (Fig. 72). Forewing length 12-18 mm. **Head:** Orange. **Thorax:** Orange. Forewings yellow-orange to red-brown, with veins yellow. Hindwings yellow-orange, paler than forewings. Ventral wings yellow-orange. Legs orange. **Abdomen:** Orange. Genitalia as in Figure 164.

Adult Female (Fig. 73). Forewing length 19-25 mm. Colored as in male, but forewing veins do not contrast as much with ground color. Forewing anal angle not as developed. Genitalia as in Figures 27-32 and 237.

Types. Lectotype male, and 5 male and 3 female paralectotypes, here designated, USNM 12548 (*coa*); lectotype male, and 2 paralectotype males, here designated, USNM 22497 (*moribunda*) (also 2 male paralectotypes at CMNH and 1 male at BMNH); lectotype female, and paralectotype female, here designated, USNM 27866 (*canaquitam*).

Type localities. Mexico, Veracruz, Jalapa (*coa*); Guatemala, Volcán de Santa María (*moribunda*); Mexico, Quintana Roo, Payo Obispo [now Chetumal] (*canaquitam*).

Hosts. "Almond" (Dyar, 1925a,b), determined as *Terminalia* sp. (Combretaceae) by L. D. Gomez; *Coffea* sp. (Rubiaceae) (USNM); *Citrus* spp. (Rutaceae) (USNM); *Citrus* sp. (S. Passoa, personal communication, 1985).

Immature Stages. Described by Dyar (1925b: 44-46) and Stehr and McFarland (1985: 36).

Flight Period. Year-round.

Distribution (Map 8). Southern Mexico, Belize, Honduras, Guatemala, El Salvador, Costa Rica, Panama. Recorded from Tropical Wet, Tropical Moist, Tropical Premontane Wet, Tropical Premontane Rain, Tropical Lower Montane Moist, Subtropical Wet, Subtropical Moist, Subtropical

Dry, and Warm Temperate Wet Forest Life Zones.

Material Examined. 189 males and 68 females. BELIZE: Belize [city], [no date] (BMNH); Corozal, I-1925, XI-1925, [no date] (USNM, AMNH); Punta Gorda, IV, VII-1933, VII-VIII-1934, J. J. White (BMNH); Río Grande, VII-1935, White (BMNH); COSTA RICA [localities only]: Braulio Carrillo, 700 m (USNM), 1,100 m (VOB); Buenos Aires, 200 m (VOB); Cachi (BMNH, USNM); Cariblanco (BMNH); "Costa Rica" (BMNH, USNM, ZSBS); Hacienda La Suerte, Tapezco, 29 air km W Tortuguero, 40 m (LACM); Hamburg Farm, Reventazón, 25 m (ZSBS); Juan Viñas (BMNH, CMNH, UMO); Orosí, 1,200 m (BMNH); Río La Vieja, near Lagarto (USNM); San José (BMNH, CMNH); San Pedro de Montes de Oca, larva 19-II-1934, emerged, 17-IV-1934, "on coffee and *Citrus* spp.," C. H. Ballou (USNM); Santa Rosa Nat. Park, 300 m (USNM); Sitio (CMNH); Sixaola River (BMNH, CMNH, USNM); Tuis (USNM); "am [=on Mount Turrialba]" (ZSBS); 1.5 miles [2.5 km] S Potrerillos (USNM); 4 km E Casetilla, Rincón Nat. Park (USNM); 9.4 km W Bribri, Suretka, 200 m (USNM); EL SALVADOR: San Salvador, 600 m, 19-VI-1960, B. Bechyne (ZSBS); GUATEMALA: Antigua, 1,500 m, 7-IX-1969 (USNM); Cayuga, III, VI, X-[no year] (BMNH, CMNH); Chichicastenango, 6,000 feet [1,800 m], VI-1947, H. G. Pulsifer (AMNH); Guatemala City, [no date], Rodríguez (BMNH); "La Naranja," [no date] (ZSBS); Machaquila, 8-VII-1972, V. O. Becker (VOB); Purulhá, VII-[no year], W. Schaus & J. Barnes (BMNH, USNM); "Qeuriflia," V-[no year] (BMNH); Quiriguá, III, VI-[no year], Schaus & Barnes (BMNH, USNM); San Sebastián, Retalhuleu, [no date] (USNM); Sayaxché, Petén, 8-VII-1972, Becker (VOB); Volcán de Santa María, [no date], Schaus & Barnes (lectotype of *moribunda*) (USNM, XI-[no year] (paralectotypes of *moribunda*) (USNM, CMNH, BMNH); HONDURAS: El Zamorano, larva on citrus 11-IX-1981, S. Passoa (died as pupa, genitalia examined); La Lima, "10-8-1971," H. E. Ostmark (USNM); Lancetilla, Tela, 25-26-II-1935, 30-IV-1935, M. Bates (MCZ); San Pedro Sula, 700 m, 25-VI-1979, R. D. Lehman (USNM); MEXICO [localities only]: *Campeche*: La Lucha (USNM); *Chiapas*: Chiapas (BMNH, USNM); Esmeralda (USNM); "Hamburgo," [1,150 m] (AMNH); "La Granja," [600 m] (AMNH); Ocozacoatlán, 823 m (CAS); Palenque (RT); San Jerónimo, Tacana (BMNH); "Santa Anita," [720 m] (AMNH); Tapachula (ZSBS); Teopisca, 1,900 m (VOB); 20-25 miles [32-40 km] N Huixtla (CNC); *Colima*: Colima (BMNH); *Hidalgo*: Chapulhuacán (LACM); Jacala, 4,500 feet [1,350 m] (MCZ); Santa Ana (AMNH); 2 miles [3 km] N Chapulhuacán (LACM); *Jalisco*: Jalisco (BMNH); *Nayarit*: San Blas (AMNH); *Oaxaca*: Candelaria Loxicha (BMNH); Metates (RJD); Oaxaca (BMNH); Tuxtepec (USNM); 5 miles [8 km] W Santos Reyes Pápalo (LACM); *Puebla*: Cuetzalán (RT); Villa Juárez, 1,000-1,100 m (ZSBS);

Quintana Roo: Payo Obispo [now Chetumal] (USNM, types of *canaquitani*); X-Can Nuevo (BMNH); *San Luis Potosí*: Tamazunchale, 300 feet [90 m] (AMNH, UCB); Xilitla, Vencidor Station (AMNH); *Tabasco*: Tabasco (BMNH); *Veracruz*: Coatepec (USNM, paralectotypes of *coa*; AMNH, NHMV); Córdoba (USNM, CU); Fortín de Las Flores (RJD, UCB); Huatusco (BMNH); Jalapa (USNM, types of *coa*; AMNH; BMNH; ZSBS); Misantla (AMNH, NHMV, USNM, ZSBS); Orizaba (AMNH, BMNH, USNM, ZSBS); Presidio (AMNH); Santiago Tuxtla, 800 m (VOB); Zacualpan (BMNH); *Yucatán*: Colonia Yucatán (AMNH); Mérida (AMNH); PANAMA: Ancón, [no date], E. Celestine & G. Ireneo (USNM); Bugaba, [no date], Schaus (USNM); Chiriquí, 18-II-1960, K. Brown & D. Veirs (PMY); Corozal, XI-1912, C. P. Crafts (USNM); Lino, 800 m, [no date], A. H. Fassl (USNM).

Discussion. Holland (1903: 369) recorded *Acraga coa* as "a straggler" in Arizona and is apparently responsible for modern citations of two dalcercid species in Arizona (e.g., Borror *et al.*, 1981: 519). The specimen Holland illustrated (CMNH) bears a label "caught in Coch. Co. Ariz.," but "North. Mex." appears elsewhere on the label. I have seen an additional male (SMEK) labeled "Cochise Co./June Ariz." and "U. of K./Lot 734" but no further data is available for Lot 734. Because I have seen only two old specimens, I do not trust the Arizona record and consider the specimens mislabeled.

A male (BMNH) labeled only "Colombia/Coll. by/W. E. Pratt" probably refers to that former part of Colombia that is now Panama.

Dyar (1925a: 18; 1925b: 44) recorded this "common on shade trees, especially on almond [*Terminalia*]" and "defoliating . . . almond trees" at Payo Obispo [Chetumal], Mexico.

Acraga chicana, new species Figures 74, 165; Map 8

Diagnosis. Similar to *Acraga coa*, differing in darker forewing, without pale veins (Fig. 74); differs from *Acraga melinda* group in narrower forewing (from apex to anal angle).

Adult Male (Fig. 74). Forewing length 13 mm. **Head:** Brownish orange. **Thorax:** Dorsum brownish orange, venter orange.

Forewings brownish orange. Hindwings orange. Ventral wings orange. Legs orange with brownish orange tufts. *Abdomen*: Orange. Genitalia as in Figure 165.

Adult Female. Unknown.

Type. Holotype male, AMNH.

Type Locality. Mexico, Campeche, near Xpujil, Chicana Ruins.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. January.

Distribution (Map 8). Southern Mexico, apparently in Subtropical Moist Forest Life Zone.

Material Examined. Known only from unique holotype, collected 6-I-1980 by R. Holland at ultraviolet light.

Discussion. The species name is a noun in apposition honoring the type locality.

Acraga concolor Species-Group

Diagnosis. Distinguished from other medium-sized whitish or yellow *Acraga* by having only short points or gentle lobes on the sociuncus (Figs. 166–169).

Adult Male. Medium size, 8–11 mm. Ground color: whitish or yellow. Hindwing Rs fused with Sc + R₁ in cell. Genitalia: tegumen and sociuncus fused, elongate; sociuncus with short points or gentle lobes; gnathos unfused tabs with strong median process; vinculum thin, elongate; valvae fused with juxta into cylindrical complex surrounding aedoeagus; saccus slender, elongate; aedoeagus long, slender.

Adult Female. Medium size, forewing 14 mm. Genitalia: sterigma broad; ostium bursae wide; ductus bursae long, wide; corpus bursae ovate; ductus seminalis arising at middle of ductus bursa; apophyses posteriores broad, pointed; “accessory glands” ovate in lateral view.

KEY TO CONCOLOR GROUP MALES

1. Wings yellow or whitish; upper *and* lower lobes of posterior sociuncus developed as points with strongly sclerotized tips (Figs. 166, 168, 169) 2
- Wings yellow; sociuncus upper lobe gently rounded, with no point (Fig. 167) ... *concolor*

- 2(1). Wings whitish; forewing length 8–10 mm; sociuncus lobes with upper *and* lower points developed (Fig. 169) *citrinopsis*
Wings yellow; forewing length 10–11 mm; sociuncus lobes with upper points developed less strongly than in *citrinopsis*, lower points strongly developed and slightly downturned (Figs. 166, 168) 3
- 3(2). Sociuncus lobes as in Figure 168; Venezuela *beebei*
Sociuncus lobes as in Figure 166; Colombia species C

Acraga concolor (Walker), NEW COMB.

Figures 76, 167; Map 10

Limacodes concolor Walker, 1865: 487.—Schaus, 1896b: 647 (“Not identified”).—Dyar, 1905b: 396 (“... unable to identify ... probably ... *Dalceridae*”).

Diagnosis. Similar to *Acraga citrinopsis*, differing in light yellow (not whitish) coloration and less developed lobes of sociuncus (Fig. 167).

Adult Male (Fig. 76). Forewing length 9–10 mm. Entirely light yellow (similar to *Acraga goes*), dorsal forewing darker than hindwing. Genitalia as in Figure 167.

Adult Female. Unknown.

Type. Neotype male, here designated, BMNH.

Type Locality. Brazil, Amazonas, Santo Antônio de Javari (based on neotype).

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Year-round.

Distribution (Map 10). Venezuela, Surinam, French Guiana, northern Brazil (Amazon Basin), Ecuador, Peru, and Bolivia. Most records are from Tropical Moist Forest, with several from Tropical Wet, Tropical Premontane Rain, Tropical Premontane Wet, and Subtropical Moist (?) Forest Life Zones.

Material Examined. 108 males. BOLIVIA: *La Paz*: Sarampiuni, San Carlos, 1,000 m, 2-IV, 8-IX-1950, W. Forster (ZSBS); *Santa Cruz*: “Prov. del Sara” [now Gutiérrez], 450 m, VII-1909, J. Steinbach (CMNH); BRAZIL: *Amazonas*: Canal Maturaca, Mission Cauaburi, 70 m, 14-I-1963, C. Lindemann (ZSBS); Fonte Boa, V, VI-1906, S. M. Klages (BMNH); Hyutanahan [=Huitanaã], Rio Purus, II-1922, Klages (CMNH); Manaus, 26-XI-1919, H. S. Parish (CU); Santo Antônio

de Javari, VI-1907, Klages (BMNH, neotype); São Paulo de Olivença, [no date], A. H. Fassl (ZSBS); Tefé, VIII-1935, A. M. Moss (BMNH), IX-[no year], Fassl (USNM), VII-[no year], Fassl (ZSBS); "Uyupiranga," VI-1931, W. Hopp (ZSBS); *Pará*: Belém, 20 m, I-1984, V. O. Becker (VOB); Marabá, 50 m, 9-I-1977, Becker (VOB); Ponte Nova, Rio Xingu, [no date] (USNM); ECUADOR: *Pastaza*: Alpayacu, Río Pastaza, 3,600 feet [1,100 m], [no date], M. G. Palmer (BMNH); *Tungurahua*: El Topo, Río Pastaza, 4,200 feet [1,250 m], [no date], Palmer (BMNH); *Not located*: Cashaureu[?], 4,600 feet [1,400 m], [no date], Palmer (BMNH); FRENCH GUIANA: Pied Saut, Oyapock River, II-1918, XII-1917, Klages (CMNH); Saint-Jean, III-1904, W. Schaus (USNM), [no date] (BMNH), VII-VIII-1904 (BMNH); PERU: *Loreto*: "Below Arica [Colombia]," I3-VIII-1920 (CU); Caballococha, V-VII-1884, M. de Mathan (ZSBS); Contamana, Río Ucayali, X-XII-[no year] (BMNH); [Puerto Limón], Middle Río Marañón, 22-X-1928, H. Bassler F6076 (AMNH); [Puerto Melendez], Middle Río Marañón, 27-VIII-1924, Bassler F6091 (AMNH); Río Pacaya, VII-1912, VIII-IX-1912 (BMNH); *Madre de Dios*: Río Tambopata Reserve, 30 air km SW Puerto Maldonado, 290 m, 6-20-XI-1979, J. B. Heppner (FSCA, USNM); *Puno*: La Oroya, Río Inambari, 3,100 feet [900 m], [no date] (BMNH, USNM), III-1905, wet season, G. R. Ockenden (BMNH, CMNH, USNM), IX-1904, IX-1905, dry season, Ockenden (BMNH), XI-XII-1905, Ockenden (BMNH, USNM); La Union, 2,000 feet [600 m], XII-1904, Ockenden (BMNH); Río Huacamayó, 3,100 feet [900 m], VI-1904, dry season, Ockenden (BMNH); Santo Domingo, 6,000 feet [1,800 m], XI-1904, 6,500 feet [1,950 m], IV-1902, dry season, XII-1902, wet season, Ockenden (BMNH); Tincuri, 3,400 feet [1,000 m], I-1905, wet season, VIII-1904, dry season, Ockenden (BMNH); Yahuar mayo, 1,200 feet [360 m], II-III-1912, H. & C. Watkins (BMNH); SURINAM: Moengo, Boven, Upper Cottica River, 20-27-V-1927, [W. T. M. Forbes] (CU); VENEZUELA: *Amazonas*: Cerro de la Neblina Basecamp, 0°50'N, 66°9'44"W, 140 m, 4-12-II-1984, D. Davis & T. McCabe (USNM); Río Baria, 140 m, 0°55'N, 66°10'W, 14-19-III-1984, J. A. Clavijo & J. Demarmels (UCV); 6 km E San Carlos de Río Negro, 23-XI-1984, R. L. Brown (USNM); *Bolívar*: El Dorado to Santa Elena road, Km 107, 520 m, 15-VIII-1957, F. Fernandez Y. & C. J. Rosales (UCV); Kanarakuni, 450 m, 31-I-4-II-1967, Fernandez & A. D. Ascoll (UCV, USNM); Río Surukum, Carretera Santa Elena Icabaru, 850 m, 19-31-I-1985, Fernandez *et al.* (UCV).

Discussion. "*Limacodes*" *concolor* was described (Walker, 1865: 487) from a yellow male, expanse "9 lines" [19 mm], from the "Amazon Region" in "Mr. Saunders' Collection." The type was lost in the early part of this century according to Dyar (1905b: 359) and an unpublished hand-

written note by Hampson in his personal copy (now in BMNH) of Walker (1865). Although there is enough information in the original description to indicate that the type was a dalcetid, there is not enough to place it accurately in a genus or species. The name *concolor* has, therefore, remained unidentified since the original description. To end this confusion, I am fixing the identity of *concolor* as this species by designating a neotype. There is no reason why the original type could not have been this species, because it is common in the "Amazon Region" and is the correct size and color. My proposed neotype designation has been discussed with other specialists on neotropical Lepidoptera who agree with this action.

I have also seen the following specimens, which differ slightly from typical *concolor* in the shape of the sociuncus lobes but are probably this species: 37 males and 1 female from COLOMBIA: *Cundinamarca*: Monterredondo, 1,420 m, III-X, XII-1961, J. Foerster & P. B. Schneble (ZSBS, USNM); 1 male from ECUADOR: *Zamora-Chinchipe*: Cumbaratza, 3-4-III-1965, L. E. Peña (AMNH); and 2 males from VENEZUELA: *Tachira*: Río Frio, 600 m, 2-10-IX-1981, Fernandez *et al.* (UCV, USNM).

Acraga citrinopsis (Dyar)

Figures 77, 78, 169, 242; Map 11

Anacraga citrinopsis Dyar, 1927: 550.—Sick, 1939: 1307.—Lourenção *et al.*, 1989: 109.

Anacraga sp.—Santis, 1987: 97.

Acraga citrinopsis.—Miller, 1993: 179.

Diagnosis. Similar to *Acraga concolor*, differing in whitish (not light yellow) coloration and more strongly developed lobes of sociuncus (Fig. 169); similar to *A. citrina*, differing in not having strongly pointed sociuncus processes (Fig. 169).

Adult Male (Fig. 77). Forewing length 8-10 mm. Entirely whitish with yellow tint (similar to *Acraga citrina*), dorsal forewing slightly more yellow than pale hindwing. Genitalia as in Figure 169.

Adult Female (Fig. 78). Forewing length

14 mm. Colored as in male. Anal angles less produced. Genitalia as in Figure 242.

Type. Holotype female [not male as stated by Dyar], USNM 40715.

Type Locality. Peru, Lima, "Callao."

Host. *Ricinus communis* Linnaeus (Euphorbiaceae) (Loureção *et al.*, 1989).

Immature Stages. Loureção *et al.*, 1989.

Flight Period. Year-round.

Distribution (Map 11). Venezuela, Brazil, Peru, and Bolivia, in Tropical Moist, Tropical Dry, Tropical Premontane Moist, Subtropical Moist, and Warm Temperate Moist or Dry Forest Life Zones.

Material Examined. 62 males and 6 females. BOLIVIA: *Santa Cruz*: Buena Vista, 750 m, VIII-1906-IV-1907, Steinbach (BMNH); "Prov. del Sara" [now Gutiérrez], 450 m, VII-1909, J. Steinbach (CMNH); BRAZIL: *Amazonas*: Fonte Boa, V-VI-1906, S. M. Klages (BMNH, USNM), [no date], A. H. Fassl (USNM); Hyatanahan [=Huitanaã], Rio Purus, I-II-1922, Klages (CMNH); São Paulo de Olivença, [no date], Fassl (ZSBS); Tefé, 20-I-1920, 22-XII-1919 (CMNH), X-1907, M. de Mathan (BMNH); *Goiás*: Formosa, 800 m, 19-III-1977, V. O. Becker (VOB); Ilha do Bananal, Rio Javare, 200 m, 4-8-IX-1977, 7-IX-1983, Becker (VOB); 24 km E Formoso, [ca. 900 m], 8-VI-1956, F. S. Truxal (LACM); *Mato Grosso do Sul*: Corumbá, 19-25-IV-1985, Becker (VOB); Rio Brillhante, 23-27-X-1970, Becker (VOB); *Minas Gerais*: Sete Lagoas, 720 m, 20-V-1974, Becker (VOB); *Pará*: Marabá, 50 m, 9-I-1977, Becker (VOB); Ponte Nova, Rio Xingu, [no date] (USNM); Rio Xingu Camp, 52°22'W, 3°39'S, ca. 60 km S Altamira, P. J. Spangler & O. S. Flint (USNM); Taperinha, 11-20-VI-1927, Zerny (NHMV); *São Paulo*: Junqueirópolis, VI-1984, A. L. Loureção, reared from mamona (VOB); PERU: *Lima*: "Callao," [no date], Mrs. M. J. Pusey (USNM, holotype, data may be incorrect); *Loreto*: Middle Río Ucayali, 15-VIII-1923, H. Bassler F6191 (AMNH); Río Napo, 6-VI-1920 (CMNH); Río Ucayali, 3-XII-1926, Bassler F6165 (AMNH); [Roaboya], Middle Río Ucayali, 4-I-1927, Bassler F6131 (AMNH); Yurimaguas, Río Huallaga, 15-17-IV-1920 (CMNH); VENEZUELA: *Amazonas*: Cerro de la Neblina Basecamp, 0°50'N, 66°9'44"W, 140 m, 20-II-1985, P. & P. Spangler *et al.* (USNM); *Barinas*: Reserva Forestal de Tipoporo, 230 m, 26-29-III-1968, F. Fernandez Y. & C. J. Rosales (UCV); *Bolívar*: Kanarakuni, 450 m, 2-II-1967, Fernandez & A. D. Ascoll (USNM); Río Surukum, Carretera Santa Elena Icabaru, 850 m, 19-31-I-1985, Fernandez *et al.* (UCV); *Carabobo*: San Esteban, VII-1909, Klages (BMNH); *Falcón*: Palma Sola, 1896, Whytman (BMNH).

Discussion. The unique female holo-

type of *Acraga citrinopsis* is in poor condition, but it matches reared females from São Paulo that are associated with males like those described here. The type locality may be incorrect; specimens from Callao "are probably mislabelled as this locality is a desert area" (Becker, 1982: 231).

This species "caused considerable damage" to leaves of the crop "mamona" (*Ricinus communis*) in São Paulo, Brazil (V. O. Becker, personal communication, 1985; Loureção *et al.*, 1989). Santis (1987) recorded parasites from this species under the name *Anacraga* sp., which was provided by me early in the present study.

Acraga species C Figure 166; Map 12

Diagnosis. Similar to other light yellow *Acraga*, differing in strongly developed sociuncus lobes (Fig. 166); very similar to *Acraga beebei*, differing in development of sociuncus lobes (Fig. 166).

Adult Male. Forewing length 10-11 mm. Forewing yellowish dorsally (like *Acraga concolor*); dorsal hindwing and ventral wings pale yellow or whitish. Sociuncus lobes with upper points developed (but not quite as strongly as in *A. citrinopsis*), bottom points strongly developed and slightly downturned (Fig. 166).

Adult Female. Unknown.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. August.

Distribution (Map 12). Colombia, in Tropical Premontane and Lower Montane Wet Forest Life Zones.

Material Examined. 2 worn males. COLOMBIA: *Cundinamarca*: Pacho, 2,200 m, [no date], A. H. Fassl (NHMV, genitalia 85-60); *Risaralda*: "Pueblo Rico [Pueblorrico], [Río] San Juan, Choco," 5,200 feet [1,550 m], VIII-1909, [probably collected by M. G. Palmer] (BMNH, genitalia 85-7).

Discussion. This species may be an Andean variant of *Acraga beebei*, but examination of more material is necessary to resolve its status.

Acraga beebei, new species

Figures 79, 168; Map 2

Diagnosis. Differing from other light yellow *Acraga* in strongly developed sociuncus lobes (Fig. 168); very similar to *Acraga* species C, differing in development of sociuncus lobes (see later and Fig. 168).

Adult Male (Fig. 79). Forewing length 10 mm. **Head:** Light yellow. **Thorax:** Dorsum light yellow; venter whitish. Forewings light yellow. Hindwings whitish. Ventral wings whitish. Forelegs yellow; other legs whitish. **Abdomen:** Whitish. Genitalia as in Figure 168.

Adult Female. Unknown.

Type. Holotype male, USNM 103447.

Type Locality. Venezuela, Aragua, Rancho Grande.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. January, June, August, September, and November.

Distribution (Map 2). Northern Venezuela, in Tropical Premontane Moist Forest Life Zone.

Material Examined. 7 males (all paratypes). VENEZUELA: *Aragua:* Rancho Grande, 1,100 m, 17–20-I-1978, J. B. Heppner (USNM), 18–VI-1946 (AMNH), 8–21-VIII-1967, R. W. Poole (USNM, including holotype), 2–IX-1980, F. Fernandez Y. & J. L. Garcia (UCV), 8–XI-1955, Fernandez & C. J. Rosales (UCV).

Discussion. This species differs as follows in male genitalia from *Acraga* species C (lateral view): sociuncus–tegumen complex more rounded at top of slope down to lobes, upper lobe shape differs (especially in development of posterior point), and lower lobe turns down more quickly. The species name honors William Beebe, who opened the field stations that contributed greatly to our knowledge of Dalceridae of Guyana, Trinidad, and Venezuela.

Acraga melinda Species-Group

Diagnosis. Differs from *Acraga flava* group and *Acraga hamata* group in coloration (orange, orange-brown, or fore-

wings brownish red with hindwings transparent yellow), and genitalia (Figs. 170–174).

Adult Male. Medium size, forewing 11–17 mm. Ground color: both wings orange or orange-brown, or forewings brownish red with hindwings transparent yellow. Male forewing somewhat falcate. Hindwing Rs not fused with Sc + R₁ in cell. Genitalia: tegumen and sociuncus fused, elongate; sociuncus with bluntly pointed downward-directed lateral lobes; uncus with two dorsal processes; gnathos nearly rectangular tabs; vinculum thin, elongate; complex (=anellus?), sometimes well sclerotized, encasing aedoeagus; valvae reduced to lobes on complex encasing aedoeagus; aedoeagus long, slender, slightly bent, external end with fine barbs.

Adult Female. Medium to large, forewing 16–23 mm. Genitalia: sterigma broad, usually strongly sclerotized; ostium bursae broad, usually strongly sclerotized; ductus bursae long; corpus bursae elongate ovate; ductus seminalis arising about middle of ductus bursae; apophyses posteriores short to medium length, medium width at base, narrowing to apex; “accessory glands” ovate in lateral view.

KEY TO MELINDA GROUP MALES

1. Wings orange or orange-brown (Figs. 83, 85) 2
 - Forewings brownish red, hindwings transparent yellow (Fig. 80); Andes — *perbrunnea*
- 2(1). Gnathos tabs bent sharply laterally near tips (Fig. 170); Central America — *melinda*
Gnathos tabs gently curved (Figs. 171–173); South America 3
- 3(2). Complex surrounding aedoeagus forming a strong shelf ventral to aedoeagus (Figs. 172, 173); shelf ends in 2 lobes but without lobes on ventral surface; “valley” between dorsal uncus points narrow; Andes 4
 - Complex surrounding aedoeagus not forming a strong shelf; 2 small lobes on ventral surface of complex; “valley” between dorsal uncus points broad (Fig. 171); Amazon Basin *amazonica*
- 4(3). Dorsal points of uncus much narrower (in lateral view) than high (Fig. 172) *meridensis*

Dorsal points of uncus about as wide (in lateral view) as high (Fig. 173) *mariala*

Acraga melinda (Druce)

Figures 83, 84, 170, 241; Map 13

Pinconia melinda Druce, 1898: 441, pl. LXXXVII, fig. 24.

Acraga melinda:—Dyar, 1898: 232.—Dyar and Strand, 1913b: 28.—Hopp, 1921: 279.—Sick, 1939: 1305.

Diagnosis. Similar to the sympatric *Acraga hamata* but orange, not yellow; similar to *A. coa* but without pale veins on forewing; differs from related Andean species in genitalia (Figs. 170, 241).

Adult Male (Fig. 83). Forewing length 14–17 mm. Entirely orange-yellow, hindwing lighter than forewing, ventral body and wings pale. Wing shape as in *A. hamata*. Genitalia as in Figure 170.

Adult Female (Fig. 84). Forewing length 20–23 mm. Colored as in male. Wing angles less developed than those of male. Genitalia as in Figure 241.

Type. Holotype female, ZMHB.

Type Locality. Panama, Volcán de Chiriquí.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. February to March, May to September, and December.

Distribution (Map 13). Costa Rica and Panama, in Tropical Premontane Wet and Rain Forest Life Zones.

Material Examined. 30 males and 4 females. COSTA RICA: "Costa Rica," "1 1/2 1928," O. Bogh (ZMUC); "Costa Rica," [no date], A. H. Fassl (ZSBS); Estacion Carrillo, Parque Nacional Braulio Carrillo, 700 m, V-1985, IX-1984, J. & A. Chacon (USNM); Juan Viñas, VI-[no year], W. Schaus & J. Barnes (BMNH, USNM); La Fuente, Turrialba, III-1940, A. Alfaro (USNM); Monteverde, 1,400 m, 6-IX-1982, C. Nagano & M. Hayes (LACM), 1,300–1,400 m, 20–21-VII-1982, D. H. Janzen & W. Hallwachs (USNM); Moravia de Chirripó, 1,000 m, 10-V-1983, Janzen & Hallwachs (USNM); Orosí, 1,200 m, [no date], Fassl (BMNH); Sitio, VI-[no year], Schaus (BMNH, CMNH); Tuis, 28-V–4-VI-[no year], Schaus (USNM); Turrialba, 600 m, 20-VIII-1971, V. O. Becker (VOB), 7-VI-1986, S. Passoa (USNM); Volcán de Turrialba, 1,800 m, 13-VIII-1972, Becker (VOB); 3 km S Casa Mata, 16 km S San Isidro de Tejar, 1,800 m, 4-XII-1983,

Janzen & Hallwachs (USNM); PANAMA: Lino, 800 m, [no date], Fassl (USNM, ZSBS); Volcán de Chiriquí [now Barú], [no date], Troetsch (ZMHB, holotype), 16–17-II-1936, F. E. Lutz & W. J. Gertsch (AMNH).

Discussion. The Brazilian records of *Acraga melinda* (Bertels and Baucke, 1966: 40; Biezanko, 1961a: 3; 1961b: 4; Mariconi and Soubihe Sobrinho, 1961: 38; Silva *et al.*, 1968: 295; Duarte, 1947: 189; Lima, 1936: 279) probably apply to *A. ochracea*. *Acraga melinda* is apparently restricted to elevations above 600 m.

The following specimens from Ecuador are very close to *Acraga melinda* but differ slightly in the shape of the dorsal uncus points: *Cañar*: 20 km SE La Troncal, 2,200 feet [660 m], 25-VI–21-VII-1984, S. J. Weller & N. L. Jacobson (USNM, 4 males, 1 female); *Pichincha*: Tinalandia, 700 m, 21-VII-1985, C. V. Covell (USNM, 1 male).

Acraga amazonica, new species

Figure 171; Map 14

Diagnosis. Similar to *Acraga melinda*, differing in less developed sociuncus points, shape of gnathos, and complex around aedeagus (Fig. 171).

Adult Male. Forewing length 11–13 mm. Entirely orange brown. Hindwing slightly paler than forewing. Genitalia as in Figure 171.

Adult Female. Unknown.

Type. Holotype male, BMNH.

Type Locality. Brazil, Amazonas, Fonte Boa.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. February, May to September, November, and December.

Distribution (Map 14). Northern Brazil (Amazon Basin), in Tropical Moist Forest Life Zone.

Material Examined. 14 males (all paratypes). BRAZIL: Amazonas: Fonte Boa, V, VII–IX-1906, S. M. Klages (BMNH, including holotype); Nova Olinda, Rio Purus, VI-1922, Klages (CMNH); Remate de Males [now Atalaia do Norte], Rio Javari, 21-II-1920, H. S. Parish (CU); São Paulo de Olivença, V-1907, Klages (BMNH), VI–VII-1935, A. M. Moss (BMNH), VII-

1933, S. Waehner (BMNH), XI-XII-[no year], A. H. Fassl (USNM), [no date], Fassl (ZSBS).

Discussion. The species name refers to the distribution of this species in the Amazon Basin.

Acraga meridensis Dognin
Figures 85, 172, 240; Map 13

Acraga meridensis Dognin, 1907: 23.—Dyar, 1910c: 117.—Dyar and Strand, 1913b: 28.—Sick, 1939: 1305.

Diagnosis. An Andean species similar to *Acraga mariala*, differing in male genitalia, especially the points on sociuncus being narrow in lateral view (Fig. 172) and female genitalia, especially the larger ductus bursae (Fig. 240).

Adult Male (Fig. 85). Forewing length 11–13 mm. Entirely orange-brown. Hindwing slightly paler than forewing. Genitalia as in Figure 172.

Adult Female. Forewing length 17–19 mm. Colored as in male. Anal angles less developed. Genitalia as in Figure 240.

Type. Lectotype male, paralectotype male, here designated, USNM 29812.

Type Locality. Venezuela, Mérida.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. April to November.

Distribution (Map 13). Andes of Venezuela and Colombia, probably in Tropical Premontane and Lower Montane Moist (Wet?) Forest Life Zones.

Material Examined. 22 males and 2 females. COLOMBIA: *Cundinamarca*: Monterredondo, 1,420 m, IV-1961, XI-1956, J. Foerster, VI-1959, various dates IV-X-1961, P. B. Schneble (ZSBS); VENEZUELA: *Mérida*: Mérida, [no date] (USNM), [no date] (ZSBS); Mérida, XI-1898, S. Briceno (BMNH), [no date], Briceno (BMNH, USNM).

Discussion. One male from PERU: *Puno*: La Oroya, Río Inambari, 3,100 feet [900 m], IX-1904, G. R. Ockenden (BMNH) is very close to *Acraga meridensis* but varies in genitalia in the more delicately proportioned sociuncus lobes and more shal-

low medial cleft in the plate below the aedoeagus.

Acraga mariala Dognin
Figures 173, 239; Map 14

Acraga mariala Dognin, 1923b: 17.—Sick, 1939: 1306.

Diagnosis. An Andean species similar to *Acraga meridensis*, differing male genitalia, especially the points on sociuncus being wide in lateral view (Fig. 173), and female genitalia, especially smaller ductus bursae (Fig. 239).

Adult Male. Forewing length 13 mm. Superficially like *Acraga meridensis*, differing in male genitalia (Fig. 173).

Adult Female. Forewing length 16 mm. Colored as in male. Anal angles less developed. Genitalia as in Figure 239.

Type. Holotype female, USNM 29813.

Type Locality. Colombia, Cundinamarca, Bogotá, Insitit de la Salle.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. July and August.

Distribution (Map 14). Colombia, apparently in Tropical Lower Montane or Premontane Wet, and Tropical Lower Montane Moist Forest Life Zones.

Material Examined. 1 male and 2 females. COLOMBIA: *Cundinamarca*: Bogotá, Insitit de la Salle, 8-VII-1919, Brother Apollinaire-Marie (USNM, holotype); Bogotá, 2,800–3,200 m, [no date], A. H. Fassl (USNM); Finca San Pablo, 1,800 m, 3 km N Albán, 1-12-VIII-1967, P. & B. Wygodzinsky (AMNH).

Discussion. The association of the Colombia male with the female holotype of *Acraga mariala* is tentative. The male genitalia of a unique specimen from ECUADOR: *Pastaza*: Alpayacu, Río Pastaza, 3,600 feet [1,100 m], [no date], M. G. Palmer (BMNH) differ from the Colombia male in having the dorsal lobes of the sociuncus pointed anteriorly (not posteriorly), the “shoulder” of the sociuncus more strongly produced dorsally, and the tabs of the gnathos shorter. The Ecuador male may be a variant of *Acraga melinda* or may represent a distinct species.

Acraga perbrunnea Dyar
Figures 80, 174; Map 7

Acraga perbrunnea Dyar, 1927: 550.—Sick, 1939: 1307.

Diagnosis. Distinctive in thinly scaled brownish red forewings and transparent yellow hindwings (Fig. 80).

Adult Male (Fig. 80). Forewing length 14 mm. **Head:** Pale orange. **Thorax:** Dorsum light orange, venter pale orange. Forewings brownish red, thinly scaled. Hindwings transparent yellow with pale orange fringe, especially around anal angle. Ventral wings as dorsal. Legs pale orange. **Abdomen:** Pale orange. Genitalia as in Figure 174.

Adult Female. Unknown.

Type. Holotype male, USNM 40714.

Type Locality. Peru, Pasco, Oxapampa, 2,000 m.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Unknown.

Distribution (Map 7). Colombia and Peru, in Tropical Lower Montane Moist (maybe also Dry) and Tropical Premontane (or Lower Montane) Wet Forest Life Zones.

Material Examined. 8 males. COLOMBIA: *Cundinamarca*: "Pueblo Guasca, Bogotá," [no date] (USNM, BMNH, CU); *Quindío*: Río Nabarco, [no date] (BMNH); PERU: *Pasco*: Oxapampa, 2,000 m, [no date] (USNM, holotype).

Discussion. The holotype is badly rubbed and missing its abdomen. I tentatively place *Acraga perbrunnea* here, but it may belong to the *Acraga infusa* group (especially based on aedeagus shape).

Acraga citrina Species-Group

Diagnosis. Distinguished from other whitish or yellow *Acraga* in northern South America by the long processes of the male sociuncus (Figs. 175, 198).

Adult Male. Medium size, forewing 9–11 mm. Ground color: whitish or pale yellow. Hindwing Rs fused with Sc + R₁ in cell. Genitalia: tegumen and sociuncus fused, elongate; sociuncus with long pro-

cesses; gnathos a median hairy lobe or tabs, with lateral arms; vinculum thin, elongate; valvae fused into complex with juxta; sacculus slender, elongate; aedeagus long, slender.

Adult Female. Medium size, forewing 14–15 mm. Genitalia: sterigma broad; ostium bursae medium width; ductus bursae long, medium width; corpus bursae spherical; ductus seminalis arising in middle of ductus bursa; apophyses posteriores broad, pointed; "accessory glands" elongate ovate in lateral view.

Discussion. *Acraga citrina* is a common, genitally distinctive species. *Acraga hoppiana*, known only from four males, is provisionally placed here.

KEY TO CITRINA GROUP MALES

Wings whitish; sociuncus with 2 pairs of elongate ventral-directed processes (total of 4 closely grouped points) (Fig. 175); northern South America *citrina*
Forewings yellow, hindwings whitish; sociuncus with long paired semicircular processes arising from dorsal surface, curving dorsally and then back posterolaterally (Fig. 198); Colombia and Ecuador *hoppiana*

Acraga citrina (Schaus),
RESURRECTED COMB.

Figures 12, 20, 22, 42, 81, 82,
175, 246; Map 12

Dalcera citrina Schaus, 1896a: 57.—Dyar, 1896: 57.

Epipinconia citrina:—Dyar, 1898: 233.

Anacraga citrina:—Dyar, 1910c: 119.—Dyar and Strand, 1913b: 29.—Sick, 1939: 1307.

Acraga citrina:—Kaye and Lamont, 1927: 121.

Anacraga albescens Hopp, 1928a: 286.—Sick, 1939: 1308. NEW SYN., NEW COMB.

Diagnosis. Differs from *Acraga citrinopsis* (a more southern species) only in male genitalia (Fig. 175); distinguished from *A. concolor* by whitish coloration and male genitalia (Fig. 175).

Adult Male (Fig. 81). Forewing length 9–11 mm. Entirely whitish with yellow tint, with whitish hindwing. Genitalia as in Figure 175.

Adult Female (Fig. 82). Forewing length 14–15 mm. Colored as in male, anal angles

of wings less developed. Genitalia as in Figure 246.

Types. Lectotype male, here designated, USNM 12549 (*citrina*); holotype male, ZSBS (*albescens*).

Type Localities. Trinidad (*citrina*); Venezuela, Aragua, Maracay (*albescens*).

Hosts. *Melicoccus bijugatus* Jacquin (UCV, as mamon) (Sapindaceae); *Ricinus* sp. (USNM) and *Ricinus communis* Linnaeus (UCV, as tartago) (Euphorbiaceae); *Terminalia catappa* Linnaeus (UCV, as almendron) (Combretaceae).

Immature Stages. Undescribed.

Flight Period. Year-round.

Distribution (Map 12). Trinidad, Venezuela, Guyana, Surinam, French Guiana, and northern Brazil, in Tropical Moist, Tropical Dry, Tropical Premontane Moist, and Tropical Premontane Dry Forest Life Zones.

Material Examined. 108 males and 19 females. BRAZIL: Pará: Amazon between Gurupá and Almeirim, 29-V-1927, Zerny (NHMV); Belém, 20 m, I-1984, V. O. Becker (USNM); Capitão Poço, 19-22-XI-1984, Becker (VOB); Pará [=Belém], [no date], A. M. Moss (BMNH); Prata [S of Igarapé Açu], 1920, A. H. Fassl (USNM); *Pernambuco*: Pernambuco [=Recife], 31-VII-1928, "s/ *Ricinus*," D. B. Pickel (USNM); Tapera, [no date], Pickel (USNM); FRENCH GUIANA: Mana River, V-1917 (CMNH); Pied Saut, Oyapock River, II-1918, S. M. Klages (CMNH); Saint-Jean, VII-1904, W. Schaus (USNM), III-1904, Schaus (BMNH), VII-VIII-1904, [no date] (BMNH); Saint-Laurent, IV-[no year] (USNM, female only), IV-1906, IX-X-1905 (BMNH), [no date] (MNHP); 60 miles [100 km] up Maroni River, VIII-1904, Schaus (USNM); GUIANA: Potaro, I, II, IV-1908, Klages (BMNH); Takutu Mtns., 6°15'N, 59°5'W, 14-XII-1983, P. Spangler & W. Steiner (USNM); Tumatumari, Potaro River, 27-VI-1927, [W. T. M. Forbes] (CU); "bought at Georgetown by Mr. Whitford" (BMNH); SURINAM: Aroewarwa Creek, Maroewym Valley, III-VI-1905, Klages (BMNH); Geldersland, Surinam River, [no date] (USNM); Moengo, Boven, Upper Cottica River, 18-22-V-1927, [Forbes] (CU, USNM); TRINIDAD: "Trinidad," [no date] (USNM, including lectotype of *citrina*), 28-I-1929 (AMNH); Arima Valley, 6-II-1950, 29-II-1952, 19-V-1951 (AMNH); Caparo, XI-XII-1905, Klages (BMNH); Curepe, 11-20-I-1982, 28-IX-4-X-1981, M. J. W. Cock (CIBC); Palmiste, 29-II-1932, 15-I-1947[?] (UWIT); Parrylands Oilfield, La Brea Ward, 13-XI-1980, Cock (CIBC); San Fernando[?], 22-II-1922 (UWIT); Textel Installation, Moune Bleu, I-III-1981, 29-III-1979, Cock (CIBC, MJWC);

Valencia Forest, 2.5 miles [4 km] SE Valencia, IV-1980, Cock (CIBC); [no locality] (UWIT); VENEZUELA: Aragua: El Limon, 450 m, 7-I-1964, C. J. Rosales, "ex larva en tartago," 25-VII-1962, F. Fernandez Y., 29-IX-1958, "ex larva en mamon," 19-I-1959, "ex larva en almendron," M. Gelvez (UCV); Maracay, [no date], P. Vogl (ZSBS, holotype and paratype of *albescens*), IV-V-1934, Vogl (BMNH), IV, VI, VIII-1936, Vogl (ZSBS); Maracay, 450 m, 1-10-VIII-1962, J. R. Reguena, "ex larva en almendron" (UCV); Bolívar: El Bochinchá Res. Forestal Imataca, 200 m, 16-18-V-1985, 6-13-XII-1974 (UCV); Delta Amacuro: La Horqueta, 0-100 m, 30-VIII-1975, R. E. Dietz (UCV); Miranda: Valle Río Cuira, 280 m, SW Panaguiré, ca. 10°12'N, 66°17'W, 18-21-IX-1979, Fernandez (UCV); Monagas: "N. Morichal Largo (Puente)," 2-3-IX-1975, Dietz (UCV).

Discussion. Kaye and Lamont (1927: 121) incorrectly recorded *Acraga citrina* from Costa Rica and Peru.

Acraga hoppiana, new species
Figure 198; Map 11

Diagnosis. Differs from other yellow *Acraga* in possessing large, semicircular dorsal processes of sociunucus (Fig. 198).

Adult Male. Forewing length 9-10 mm. *Head:* Pale yellow. *Thorax:* Dorsum yellow; venter pale yellow. Forewings yellow. Hindwings whitish. Ventral wings whitish. *Abdomen:* Whitish. Genitalia as in Figure 198.

Adult Female. Unknown.

Type. Holotype male, ZSBS.

Type Locality. Colombia, Cauca, Río [San Juan de] Micay.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. July and August.

Distribution (Map 11). Colombia, probably in Tropical Wet Forest and perhaps in Tropical Premontane Rain Forest Life Zones; Ecuador, probably in Tropical Lower Montane Dry Forest Life Zone.

Material Examined. 4 males. COLOMBIA: Cauca: Río [San Juan de] Micay, [no date], W. Hopp (ZSBS holotype, USNM paratype); ECUADOR: Cañar: 20 km SE La Troncal, 2,200 feet [660 m], 29-VII-3-VIII-1984, S. J. Weller & N. L. Jacobson (BMNH, USNM, paratypes).

Discussion. Differing in male genitalia from other *Acraga* in having upper pro-

cesses of sociuncus large, semicircular, with tips pointing ventrally; lower processes as small points; median lobe of gnathos paired diverging flattened plates, lateral arms long and strong, extending along vinculum almost to saccus. The species name honors the Hopp brothers, Werner for his collections of dalcenids, and Walter for his studies of them.

Acraga ferruginea Species-Group

Diagnosis. Differs from all *Acraga* in southern Brazil and adjacent areas (except *Acraga obscura*) in dark coloration (Figs. 147–149); differs from *A. obscura* in coloration and male genitalia.

Adult Male. Medium size, forewing 9–12 mm. Ground color: Brown or brownish red. Hindwing Rs not fused with Sc + R₁ in cell. Genitalia: tegumen and sociuncus fused, elongate; sociuncus with hoodlike lobes or a pair of long points; gnathos a median lobe with lateral arms; vinculum thin, elongate; valvae fused with juxta into complex surrounding aedoeagus; saccus medium length, medium width; aedoeagus long, slender.

Adult Female. Medium size, forewing 16–17 mm. Genitalia: sterigma broad and strongly sclerotized; ostium bursae wide and sclerotized; ductus bursae medium width; corpus bursae damaged in available specimens; ductus seminalis arising at first bend in ductus bursae; apophyses posteriores short, narrow, bluntly pointed; “accessory glands” ovate in lateral view.

Discussion. The association of these two poorly known species with each other is provisional.

KEY TO FERRUGINEA GROUP MALES

- Wings brown (Fig. 149); forewing ca. 9 mm *brunnea*

 Wings brownish rusty red (Fig. 147); forewing
 ca. 12 mm *ferruginea*

Acraga ferruginea Hopp

Figures 45, 147, 148, 176, 238;
 Map 15

Acraga ferruginea Hopp, 1922: 430.—Sick, 1939: 1306.

Diagnosis. Males differ from *Acraga obscura* in longer forewing and darker coloration (especially of hindwing) and from *Acraga brunnea* in larger size and lighter, more reddish coloration.

Adult Male (Fig. 147). Forewing 12 mm. **Head:** Brownish ochreous. **Thorax:** Brownish ochreous, venter paler than dorsum. Forewing brownish rusty red. Hindwing brownish rusty red, paler along costal margin. Legs brownish ochreous. **Abdomen:** Rusty red. Genitalia as in Figure 176.

Adult Female (Fig. 148). Forewing 16–17 mm. Colored as in male, but somewhat lighter. Wings more elongate and rounded. Genitalia as in Figure 238.

Type. Holotype female (missing abdomen), ZSBS.

Type Locality. Brazil, Espírito Santo, [Alegre], Fazenda Jerusalem.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. March, June, July, September, and October.

Distribution (Map 15). Southern Brazil, in Subtropical Wet and Moist Forest Life Zones.

Material Examined. 1 male, 4 females. BRAZIL: *Espírito Santo:* [Alegre], Fazenda Jerusalem, 19-IX-1913, J. F. Zikan (ZSBS, holotype); *Rio de Janeiro:* [Itatiaia, 400 m], 9-III-1925, 27-VI-1933, 25-VII-1926, 11-X-1934, Zikan (IOC).

Discussion. Sick (1939: 1306) incorrectly cited the type locality of *Acraga ferruginea* as Pachitea, Peru.

Acraga brunnea, new species

Figures 149, 177; Map 15

Diagnosis. Distinguished from all *Acraga* by dark brown color (Fig. 149); smaller and darker than both *Acraga ferruginea* and *Acraga obscura*.

Adult Male (Fig. 149). Forewing length 9 mm. **Head:** Light brown. **Thorax:** Dorsum deep brown, venter tan. Forewings dark brown. Hindwings dark brown, lighter than forewings, especially at costal margin. Ventral wings color of dorsal hindwings. Forelegs light brown, other legs tan. **Abdomen:** Dorsum color of dorsal hind-

wing, venter tan. Genitalia as in Figure 177.

Adult Female. Unknown.

Type. Holotype male, MNRJ.

Type Locality. Brazil, Rio de Janeiro, Petrópolis, 600 m.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. October and December.

Distribution (Map 15). Southern Brazil, in Subtropical Moist and Subtropical Lower Montane Wet Forest Life Zones.

Material Examined. 2 males. BRAZIL: *Espírito Santo*: "Esp. St.o" [Baixo Guandú], XII-1920, [F. Hoffmann] (ZSBS, paratype); *Rio de Janeiro*: Petrópolis, 600 m, 10-X-1985, S. E. Miller & V. O. Becker (MNRJ, holotype).

Discussion. The sociuncus of this species is divided into two lobes widely separated by the anal area, each lobe having one long, pointed, slightly curved, posteriorly directed process. The gnathos is similar to that of *Acraga goes* but with two long arms fused most of their length.

The specimen from Espírito Santo, although from the J. Arp collection, must have been collected by Hoffmann at Baixo Guandú (V. O. Becker, personal communication, 1985). The species name refers to its dark brown color.

Acraga ampela Species-Group

Diagnosis. Differ from other *Acraga* in white or yellow ground color, with brown pattern (Figs. 87–92, 115, 116).

Adult Male. Medium size, forewing 11–17 mm. Ground color: White or yellow, with brown pattern. Hindwing Rs not fused with Sc + R₁ in cell. Genitalia: sociuncus and tegumen fused, elongate; sociuncus terminating in small paired dorsal lobes and/or ventral points; gnathos usually strongly developed as two rectangular tabs, with lateral arms rudimentary or of several pairs of slender short to long hooklike processes; vinculum of medium thickness; valvae reduced into complex with juxta; juxta fused into strong curved platelike complex ventral to and supporting aedoeagus; sacculus medium length, medium diameter

throughout length; aedoeagus long and stout, with a small patch of cornuti on the vesica.

Adult Female. Medium size, forewing 16–19 mm. Genitalia: sterigma broad, with concave sclerotized ventral lip; ostium bursae wide; ductus bursae wide and well sclerotized, then narrowing, bending and becoming membranous; corpus bursae spherical; ductus seminalis arising from bend; apophyses posteriores medium length, narrow; "accessory glands" ovate in lateral view.

KEY TO AMPELA GROUP MALES

(Undescribed new species near *leberna* not included; identifications of worn specimens should be confirmed by examination of genitalia.)

1. Forewing ground color yellow 2
- Forewing ground color whitish 4
- 2(1). Forewing with well-defined subterminal and postmedial bands (Fig. 89); hindwing white; Bolivia and western Brazil *boliviana*
- Forewing without well-defined subterminal and postmedial bands (Figs. 90, 91); hindwing yellow 3
- 3(2). Forewing with brown angled line at end of discal cell (Fig. 90); smaller, forewing 11–12 mm; Guianas and Trinidad *angulifera*
- Forewing without angled line at end of cell (Fig. 91); larger, 11–15 mm; Panama and northern South America *leberna*
- 4(1). Forewings mostly white with patterning of mostly well-defined dark brown lines (Fig. 87); larger, forewing 14–17 mm; Colombia, Bolivia, and Peru *ampela*
- Forewings suffused with brown and/or any brown lines poorly defined (Figs. 88, 115, 116); smaller, forewing 11–14 mm 5
- 5(4). Most of outer half of forewing (including anal angle) suffused with brown (Fig. 115); Costa Rica and Panama *isothea*
- Forewing brown suffusion less extensive, anal angles whitish (Figs. 88, 116) 6
- 6(5). Smaller, forewing 11–12 mm (Fig. 116); French Guiana *umbrifera*
- Larger, forewing 14 mm (Fig. 88); Peru *puno*

Acraga ampela (Druce), NEW COMB. Figures 87, 178–180; Map 16

Dalcera ampela Druce, 1890: 505.—Kirby, 1892: 542.—Dyar, 1898: 231.—Hopp, 1921: 280.

Dalcera? ampela.—Dyar and Strand, 1913b: 27.—Sick, 1939: 1304.

Acraga cosmia Dognin, 1911: 63.—Dyar and Strand, 1913b: 29.—Sick, 1939: 1306. NEW SYN.

Diagnosis. Similar to *Dalcerides alba*, but larger and without brown forewing anal angle (Fig. 87); similar to *Acraga puno*, differing in more clearly defined wing pattern (Fig. 87) and male genitalia (Figs. 178–180).

Adult Male (Fig. 87). Forewing length 14–17 mm. **Head:** Light brown. **Thorax:** Brown and white. Forewings white; brown suffusion from base to middle of inner margin, then up to CuA_2 to outer margin, then subterminally to M_2 bending inward to R_4 ; veins CuA_2 to M_2 brown between subterminal line and margin; margin brown between CuP and M_2 ; brown spot at apex. Hindwings white with brown anal angle. Ventral wings white with brown anal angles. Legs: forelegs brown, others white. **Abdomen:** Dorsum brown, venter white. Genitalia as in Figures 178–180.

Adult Female. Unknown.

Types. Holotype male, BMNH (*ampela*); holotype male, USNM 29811 (*cosmia*).

Type Localities. “Bolivia” (*ampela*); Colombia, Valle del Cauca, near Cali, San Antonio, 2,000 m (*cosmia*).

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Year-round.

Distribution (Map 16). Colombia, Peru, and Bolivia, in Tropical Wet, Tropical Moist, Tropical Premontane Wet, and Tropical Lower Montane Wet Forest Life Zones.

Material Examined. 23 males. BOLIVIA: [no further data], Buckley (BMNH, holotype of *ampela*); COLOMBIA: *Chocó*: La Selva, San Juan, 4,600 feet [1,400 m], IX-1909 (BMNH); *Cundinamarca*: Pacho, 2,200 m, Fassel (USNM); *Guainía*: Ob. [=Upper] Río Negro, 800 m, [no date], A. H. Fassel (BMNH); *Valle del Cauca*: San Antonio, 2,000 m, IV-1909, Fassel (USNM, holotype of *cosmia*); PERU: *Puno*: La Oroya, Río Inambari, 3,000 feet [900 m], V-1905, IX-1904, dry season, G. R. Ockenden (BMNH, ZSBS), I, III, XI–XII-1905, I-1906, wet season, Ockenden (BMNH); Río Huacamayo, 3,100 feet [900 m], VI-1904, dry season, Ockenden (BMNH); Santo Domingo, 6,000 feet [1,800 m], XI-1904, Ockenden (BMNH); Tincuri,

3,400 feet [1,000 m], I-1905, wet season, VIII-1904, dry season, Ockenden (BMNH); *San Martín*: Pumayacu, [no further data] (USNM).

Discussion. The male genitalia of this species varies somewhat in the shapes of the sociuncus lobes, diaphragma ridges, and complex ventral to the aedoeagus (e.g., Figs. 178–180).

Acraga puno, new species
Figures 88, 184; Map 17;
Color Plate, Figure 19

Diagnosis. Similar to *Acraga ampela*, but wing pattern less clearly defined (Fig. 88); similar to *A. umbrifera*, but larger and wing pattern is more clearly defined.

Adult Male (Fig. 88). Forewing length 14 mm. Very similar to *Acraga ampela*, differing in forewing pattern, which is lighter brown (reddish?), in lines that are not as fine; brown patch along hindwing anal angle longer, extending forward almost to M_2 ; wing angles (especially hindwing) more rounded; lateral processes of gnathos well developed; and hooklike processes dorsolateral of aedoeagus. Genitalia as in Figure 184.

Adult Female. Unknown.

Type. Holotype male, BMNH.

Type Locality. Peru, Puno, La Union, 600 m.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. March and November.

Distribution (Map 17). Southern Peru, in Tropical Moist and Tropical Premontane Wet Forest Life Zones.

Material Examined. 2 males. PERU: *Puno*: La Oroya, Río Inambari, 3,100 feet [900 m], III-1905, G. R. Ockenden, wet season (USNM, paratype); La Union, Río Huacamayo, 2,000 feet [600 m], XI-1904, Ockenden, wet season (BMNH, holotype).

Discussion. The species name is a noun in apposition referring to the type locality. I have seen one female (forewing 16 mm) that might be this species (the wing pattern is similar but more diffuse, and there is no associated male) from BRAZIL: *Amazonas*: “Iucaby” [Iucui], Río Negro, 12–VIII-1927, J. F. Zikan (IOC).

Acraga boliviana Hopp, NEW STATUS
Figures 89, 181; Map 17

Acraga cosmia var. *boliviana* Hopp, 1921: 280.—Sick, 1939: 1306.

Diagnosis. Differs from *Acraga ampela* and *A. puno* in coloration and proportions of wings (Fig. 89), and male gnathos (especially lack of development of hooklike lateral arms) (Fig. 181).

Adult Male (Fig. 89). Forewing length 14 mm. **Head:** Yellowish (worn). **Thorax:** Yellowish (worn). Forewings pale yellow with light brown subterminal (inner margin to R_5) and postmedial (inner margin to R_4) lines; veins CuA_2 to M_2 brown between subterminal line and margin; brown spot near base of inner margin. Hindwings white, margin yellowish brown around anal angle. Ventral wings white. **Abdomen:** Dorsum yellowish, venter whitish. Genitalia as in Figure 181.

Adult Female. Unknown.

Type. Holotype male, lost.

Type Locality. Bolivia, La Paz, Río Son-go [Zongo], 1,200 m, Garlepp.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. July.

Distribution (Map 17). Bolivia and western Brazil, in Subtropical Moist Forest Life Zone.

Material Examined. 1 male. BRAZIL: Amazonas: Fonte Boa, VII-1906, S. M. Klages (BMNH).

Discussion. The holotype of *Acraga boliviana* should be at ZMHB but is not (H. J. Hannemann, personal communication, 1984). A single male (BMNH) seems to match the superficial original description, but it might not be conspecific with the lost holotype. My concept of the species is based on the BMNH male.

Acraga angulifera Schaus
Figures 90, 183; Map 17

Acraga angulifera Schaus, 1905: 332–333.—Dyar, 1910c: 117.—Dyar and Strand, 1913b: 28.—Sick, 1939: 1305.

Diagnosis. Similar to *Acraga leberna*, readily distinguished by wing coloration (especially the angled line at the end of the cell; Fig. 90), more delicate build, and male genitalia (Fig. 183).

Adult Male (Fig. 90). Forewing length 11–12 mm. **Head:** Pale yellow. **Thorax:** Pale yellow. Forewings pale yellow; dark brown inwardly curved line along end of cell; subterminal brownish shade from R_5 curved inward between CuA_2 and CuP , then out to anal angle. Hindwings pale yellow; whitish toward costal margin; brown at anal angle. Ventral wings: forewing pale yellow, hindwing white with brown anal angle. Legs pale yellow. **Abdomen:** Pale yellow. Genitalia as in Figure 183.

Adult Female. Unknown.

Type. Lectotype male, and paralectotype male, here designated, USNM 8909.

Type Locality. French Guiana, Maroni River, Saint-Jean.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Year-round.

Distribution (Map 17). Trinidad, Venezuela, Surinam, and French Guiana, in Tropical Moist Forest Life Zone.

Material Examined. 18 males. FRENCH GUIANA: Mana River, VI-1917 (CMNH); Pied Saut, Oyapock River, III-1918, XII-1917, S. M. Klages (CMNH); Saint-Jean, VII-1904, W. Schaus (USNM, lectotype and paralectotype), [no date] (BMNH); Saint-Laurent, IX-1904, Schaus (USNM); [no further data], C. Bar (ZSBS); SURINAM: Aroewarwa Creek, Maroeym Valley, IV-1905, Klages (BMNH); TRINIDAD: Arima Valley, 19–21-I-1961, B. Heineman, 10–22-II-1964, Rozen & Wygodzinsky, III-1956, N.Y. Zool. Soc. (all AMNH); Morne Bleu, Textel Installation, 9-XI-1978, M. J. W. Cock (MJWC); VENEZUELA: Bolívar: Río Surukum, Carretera Santa Elena Icabaru, 850 m, 19–31-I-1985, F. Fernandez Y. *et al.* (UCV).

Acraga isothea Dognin
Figures 115, 182; Map 16

Acraga isothea Dognin, 1914: 100–101.—Sick, 1939: 1306, pl. 168f.

Diagnosis. Similar to *Acraga umbrifera*, distinguished by brown forewing anal angles (Fig. 115).

Adult Male (Fig. 115). Forewing length 12–14 mm. **Head:** Pale reddish brown. **Thorax:** Dorsum reddish brown with patches of white; venter white. Forewings white; reddish brown suffusion over inner margin (except near base), outer margin from anal angle to M_1 (except white crescents at margins between veins from CuA_2 to M_1), and postmedial area; reddish brown spot at apex. Hindwings white with reddish brown anal angle. Ventral wings white with hindwing anal angle reddish brown. Legs: forelegs reddish brown, others white. **Abdomen:** Dorsum reddish brown, venter whitish. Genitalia as in Figure 182.

Adult Female. Unknown.

Type. Lectotype male, and paralectotype male, here designated, USNM 29810.

Type Locality. Panama, Lino, 800 m.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. July.

Distribution (Map 16). Costa Rica and Panama, in Tropical Premontane Wet and Rain Forest Life Zones.

Material Examined. 5 males. COSTA RICA: Braulio Carrillo, 1,100 m, VII-1981, V. O. Becker (VOB); "Costa Rica" [no further data] (ZSBS); PANAMA: Lino, 800 m, [no date], A. H. Fassl (USNM, types; ZSBS).

Acraga leberna (Druce)

Figures 91, 92, 186, 247; Map 18;

Color Plate, Figure 20

Dalcera leberna Druce, 1890: 505.—Kirby, 1892: 542.—Dyar, 1898: 231.

Acraga leberna:—Dyar, 1910c: 117.—Dyar and Strand, 1913b: 28.—Hopp, 1921: 280.—Sick, 1939: 1305.

Acraga arcifera Dyar, 1910c: 117.—Dyar and Strand, 1913b: 29.—Sick, 1939: 1306. NEW SYN.

Diagnosis. Similar to *Acraga angulifera*, but larger and without angled line at end of forewing discal cell (Fig. 91).

Adult Male (Fig. 91). Forewing length 11–15 mm. **Head:** Pale yellow. **Thorax:** Dorsum pale yellow with reddish brown stripe on each side behind head; venter whitish. Forewings pale yellow with wide submarginal reddish brown band, faint from R_5 to CuA_1 , darker and curved in-

ward to inner margin near anal angle; inner margin dark basally; discal spot small; outer margin darkened, especially where submarginal band is close to, sometimes connected with, outer margin. Hindwings pale yellow with reddish brown anal angle. Ventral wings yellowish white with hindwing anal angle brown. Legs yellowish white with touches of reddish brown on foreleg. **Abdomen:** Dorsum yellow, venter whitish. Genitalia as in Figure 186.

Adult Female (Fig. 92). Forewing length 16–19 mm. Colored as in male. Genitalia as in Figure 247.

Types. Holotype female, BMNH (*leberna*); lectotype male, and paralectotype male, here designated, USNM 13057 (*arcifera*).

Type Localities. Ecuador, Pastaza, Sarayacu (Brown [1941: 849] cautions that all Buckley's material was not collected in the immediate vicinity of Sarayacu and some may have come from as far west as the Andean foothills) (*leberna*); French Guiana, Maroni River, Saint-Jean (*arcifera*).

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Year-round.

Distribution (Map 18). Panama, Colombia, Venezuela, Guiana, Surinam, French Guiana, Ecuador, northern Brazil (Amazon Basin), Peru, and Bolivia, in Tropical Wet, Tropical Moist, and Tropical Premontane Wet Forest Life Zones.

Material Examined. 112 males and 8 females. BOLIVIA: *Cochabamba*: Chaparé-Gebiet oberer Río Chiripirí, 400 m, 27-X-1953, W. Forster (ZSBS); BRAZIL: *Amazonas*: Amazon between Tefé and Tonantins, XI-1921 (USNM); Fonte Boa, V, VII-IX-1906, S. M. Klages (BMNH); Monte Cristo, A. H. Fassl (USNM); Reserva Ducke, Km 26 Manaus-Itacoatiara Highway, 21-IV-1972, E. G. Munroe (CNC); Rio Madeira, VII–VIII-[no year], Fassl (USNM); Santo Antônio de Javari, VI-1907, Klages (BMNH); São Paulo de Olivença, VIII, XI–XII-[no year], Fassl (USNM, ZSBS), I-1933, S. Waehner (BMNH), XII-1931–I-1932, F. Wucherpfennig (BMNH); *Pará*: Belém, 20 m, I-1984, V. O. Becker (VOB); Marabá, 50 m, 9-I-1977, Becker (VOB); Pará [=Belém], [no date], A. M. Moss (BMNH); Ponte Nova, Rio Xingu (USNM); Taperinha, 11–20-VI-1927, Zerny (NHMV); Utinga, Belém, 10-III-1964, O. H. H. Mielke (MNRJ); COLOMBIA: *Guainía*: Ob. [=Upper] Río Negro, 800 m, [no date],

Fassl (BMNH); *Meta*: Villavicencio, 400 m, [no date], Fassl (BMNH); ECUADOR: "Sarayacu" [see preceding Type Localities] (BMNH, holotype of *leberna*); FRENCH GUIANA: Nouveau Chantier, [no date] (USNM), VI-VII-[no year] (BMNH); Pied Saut, Oyapock River, III-1918, XII-1917, Klages (CMNH); Saint-Jean, III-1904 (lectotype of *arcifera*), IV-1904 (paralectotype of *arcifera*), W. Schaus (USNM), VII-VIII-1904 (BMNH); Saint-Laurent, II, VI, X, XII-[no year] (BMNH, USNM); GUYANA: Kartabu, I-IV-1922, 18-VII-1922 (AMNH, USNM); Kartabu Point, secondary forest, 24-XII-1983, W. E. Steiner (USNM); Malali, 28-I-1913 [?], H. S. Parish (CU); Potaro, V-1908, Klages (BMNH); Rockstone, 25-VI-1934, A. S. Pinkus (AMNH); Tumatumari, Potaro River, XII-1907, Klages (BMNH), 28-29-VI-1927, [W. T. M. Forbes] (CU); PANAMA: Barro Colorado Island, 11-III-1936, W. Gertsch *et al.* (AMNH); PERU: Loreto: [Contamana], Middle Río Ucayali, 12-II-1928, H. Bassler F6039 (AMNH); Puno: La Union, Río Huacamayo, 2,000 feet [600 m], XI-1904, wet season, G. R. Ockenden (BMNH); San Gaban, 2,500 feet [750 m], III-IV-1913, [H. & C. Watkins] (BMNH); Yahuar Mayo, 1,200 feet [350 m], III-1911, V-VII-1912, Watkins (BMNH); San Martín: Jepelacio (USNM); SURINAM: Aroewarwa Creek, Maroewym Valley, IV, VI, VII-1905, Klages (BMNH); VENEZUELA: *Amazonas*: San Carlos de Río Negro, 65 m, 4-14-III-1984, 21-23-X-1984, 125 m, 19-31-VIII-1976 (UCV); *Bolívar*: El Bochínche Res. Forestal Imataca, 200 m, 6-13-XII-1974 (UCV); Río Grande Research Station, 26 km E El Palmar, 700 feet [200 m], 24-25-III-1978, J. B. Heppner (USNM).

Discussion. Worn individuals, such as Druce's type, appear whitish, due to removal of yellow scales.

I have seen two very worn males, which appear to be a new species near *Acraga leberna*. The wings are whitish with a brown pattern probably similar to that of *A. leberna*; the forewing length 12-13 mm; the genitalia are similar, differing most in shape and thickness of "gnathos" processes (Fig. 187). Both specimens are from Uberaba, Minas Gerais, Brazil, [no date], purchased from E. LeMoult by W. Hopp (USNM, ZSBS). The area around Uberaba is Subtropical Moist Forest.

Acraga umbrifera (Schaus)
Figures 116, 185; Map 16

Epipinconia umbrifera Schaus, 1905: 333.
Acraga umbrifera:—Dyar, 1910c: 117.—Dyar and Strand, 1913b: 29.—Sick, 1939: 1306.

Diagnosis. Both wing pattern and male

genitalia very similar to *Acraga leberna*, but easily distinguished by white not yellow ground color; wing pattern similar to *A. isothea*, distinguished by white not brown forewing anal angle (Fig. 116).

Adult Male (Fig. 116). Forewing length 11-12 mm. **Head:** Light brown. **Thorax:** Dorsum light brown mottled with white; venter white. Forewings white with broad light brown postmedian shade, extended to fringe between M_1 and M_3 ; inner margin shaded; discal spot indistinct. Hindwings white with pale brown at anal angle. Ventral wings white. Legs white with light brown suffusion. **Abdomen:** Dorsum light brown, venter whitish. Genitalia as in Figure 185.

Adult Female. Unknown.

Type. Holotype male, USNM 8910.

Type Locality. French Guiana, Maroni River, Saint-Jean.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. March and June.

Distribution (Map 16). French Guiana, in Tropical Moist Forest Life Zone.

Material Examined. 3 males. FRENCH GUIANA: Saint-Jean, VI-1904, W. Schaus (holotype), III-[no year] (USNM); Saint-Laurent, [no date] (USNM).

Acraga ochracea Species-Group

Diagnosis. Differs from other orange *Acraga* in male genitalia, especially sociuncus and complex supporting aedoeagus (Figs. 188-191).

Adult Male. Medium size, forewing 9-14 mm. Ground color: orange, without maculation. Hindwing Rs not fused with $Sc + R_1$ in cell. Genitalia: tegumen elongate; sociuncus elongate, wider and higher than tegumen, sides developed posteriorly as blunt lateral lobes; uncus pair of hook-like down-curved processes in middle of posterior surface of sociuncus; gnathos median lobe split into upper and lower arms or fused, triangular in cross section, with or without a split in lower portion (gnathos without lateral arms); vinculum thin, elongate; valvae reduced into complex with juxta; juxta fused with valvae into complex

surrounding and supporting aedoeagus, best developed ventrally, terminating ventrally in down-curved strongly sclerotized spoutlike process; saccus of medium length and thickness; aedoeagus long, stout, curved dorsally at ends, external end sclerotized, pointed, and covered with fine hairs (vesica may also have a patch of setae).

Adult Female. Medium size, 15–17 mm. Genitalia: sterigma broad with rounded tab on each side; ostium bursae broad; ductus bursae wide to first bend, narrowing and recurved again to corpus bursae; corpus bursae ovate; ductus seminalis arising between bends; apophyses posteriores long, wide at base, narrowing to apex; “accessory glands” ovate in lateral view.

Discussion. I recognize four closely related species in this group, from southern Brazil, Uruguay, Paraguay, and northern Argentina. *Acraga ochracea* Walker was one of the first dalcercids to be named and has been frequently misidentified; a neotype is designated here to fix its identity. Orfila (1961) described the genus and species *Dalargentina sexquicentaria*, which is here placed in the *Acraga ochracea* group. I describe two new species similar to *Acraga sexquicentaria*.

Orfila (1961) separated *Dalargentina sexquicentaria* from *Acraga ochracea* as different genera, largely on the basis of the branching of the forewing radial veins. However, the species are closely related, based on the very similar male genitalia. The venation character is quite variable, and I have seen two extreme examples: *A. parana*, in which R_{2+3} and R_{4+5} are stalked on the right side, but not on the left side (BMNH, slide 85-10); and *A. ochracea*, in which R_{2+3} does not split off until just before R_4 and R_5 fork, almost forming a triple split (VOB).

KEY TO OCHRACEA GROUP MALES

1. Forewing angles, especially apex, rounded (as in most *Acraga*) (Fig. 93); usually with dense, long hairs covering dorsal portion of genitalia; gnathos strongly bifid, with short upper arm well separated from longer lower arm (Fig. 188) *ochracea*

Forewing angles, especially apex, more sharply angled (Figs. 95, 97, 98); with short or long hairs covering genitalia; gnathos somewhat triangular in lateral view, if split then no wide separation of parts (Figs. 189–191) 2

- 2(1). Forewing orange brown; gnathos split; pair of points on dorsal surface of sociuncus at articulation with tegumen (Fig. 189); with tuft of long hairs covering genitalia *victoria*

Forewing orange; gnathos split or solid; no dorsal pair of points at base of sociuncus (Figs. 190, 191); with only short hairs covering genitalia 3

- 3(2). Gnathos split; paired posterior spines on uncus of medium length and thickness (Fig. 190); forewing orange slightly darker and duller *sexquicentaria*
Gnathos solid; paired posterior spines on uncus long and thick (Fig. 191); forewing orange slightly lighter and brighter *parana*

Acraga ochracea (Walker)

Figures 93, 94, 188, 245; Map 19

Dalcera ochracea Walker, 1855b: 1107.—Kirby, 1892: 542.

Acraga ochracea:—Dyar, 1898: 232; 1910c: 116.—Dyar and Strand, 1913b: 28.—Hopp, 1921: 279.—Sick, 1939: 1305.—Orfila, 1961: 256–257, figs. 2, 6, pl. 1, figs. 3, 4.

Diagnosis. Differs from related species in male genitalia: usually with dense, long hairs covering dorsal portion of genitalia; gnathos strongly bifid, with short upper arm well separated from longer lower arm (Fig. 188).

Adult Male (Fig. 93). Forewing length 9–13 mm. Entirely orange; dorsal forewing darker than hindwing. *Abdomen*: Orange, usually with dense tuft of long hairs extending over apex of abdomen. Genitalia as in Figure 188.

Adult Female (Fig. 94). Forewing length 16–17 mm. Colored as in male, wings more elongate and rounded. Genitalia as in Figure 245.

Type. Neotype male, here designated, BMNH.

Type Locality. Brazil, Rio de Janeiro, Corcovado Forest (based on neotype).

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Year-round.

Distribution (Map 19). Southern Brazil,

Paraguay, and northern Argentina. Recorded from Tropical Premontane Moist, Subtropical Wet, Subtropical Moist, Subtropical Dry, and Warm Temperate Moist Forest Life Zones.

Material Examined. 105 males and 3 females. ARGENTINA: *Misiones*: Iguazú, II-1934, F. Bourquin (BMNH); 30-I-13-III-1945, Hayward *et al.* (ZMUC); BRAZIL: *Distrito Federal*: Planaltina, 1,000 m, III-1976, III-1977, VII-1978, V. O. Becker (CPAC, VOB); *Espírito Santo*: "Espírito Santo," [no date], F. Johnson (USNM); *Mato Grosso do Sul*: Rio Brilhante, 25-I-1971, 23-27-X-1970, Becker (VOB); *Minas Gerais*: Sete Lagoas, 720 m, 12-III-1974, Becker (VOB); Viçosa, [no date], E. J. Hambleton (CU); *Paraná*: Banhado, 800 m, 12-II-1973, Munroes (CNC); Castro, [no date] (USNM); Castro, 950 m, [no date], E. D. Jones (BMNH); Foz do Iguaçu, 28-I-1971, Laroca & Jansen (VOB); Guaraqueçaba, 9-XII-1970, Becker (VOB); Iguaçu, 20-30-X-1921, X-XII-1922 (BMNH); *Rio de Janeiro*: "Campo Bello" [Itatiaia, 400 m], III-1927, IV-1931, XI, XII-1926, J. F. Zikan (ZSBS); Corcovado Forest, 1958, H. B. D. Kettlewell (BMNH, neotype; USNM); Imbarié, 50 m, 5-I-1956, H. Ebert (ZSBS); [Itatiaia, 400 m], 4-I-1927, 18-III-1928, 1-IV-1930, 17-V-1925, 28-VI-1929, 14-IX-1926, 4-XI-1929, Zikan (IOC); Itatiaia, 800-1,200 m, 31-III-1965, Ebert (ZSBS); 10 km SW Maricá, 5 m, 12-13-I-1985, V. O. Becker (VOB); VI-1985, R. F. Monteiro (USNM), 11-12-X-1985, S. E. Miller & Becker (USNM); Petrópolis, 23-XI-1913, J. G. Foetterle (NHMV); "Prov. Rio" [Itatiaia, 400 m], 6-XII-1928, Zikan (USNM); Rio de Janeiro, 7-V-1952, Ebert (ZSBS), XI-[no year] (CMNH); *Rio Grande do Sul*: Guarani, 11-VI-1932, C. Biezanko (CU); Rio Grande do Sul, [no date] (ZSBS); *Santa Catarina*: Brusque, 100 m, 8-VII-1970, 13-VII-1966, 28-XII-1969, 1-1983, Becker (VOB); Hansa Humboldt [=Corupá], [no date] (USNM); Joinville, [no date] (USNM), 10 m, 6-XII-1969, Becker (VOB); Nova Brémen, Rio Laeiss, III-1936, F. H. Hoffmann (BMNH); Nova Teutonia, V-1938, 7-X-1939, F. Plauermann (CMNH, USNM); Santa Catarina, [no date], Hoffmann (USNM), 1921, v. Wernicke (ZSBS), [no date] (BMNH); *São Paulo*: Boracéia, Salesópolis, 800 m, 21-25-X-1963, Oliveira & Wygodzinsky (AMNH); PARAGUAY: *Guairá*: Villarrica, 21-II-1923, J. Schade (BMNH).

Discussion. Walker described *Acraga ochracea* from (apparently) one male from "Rio Janeiro. In Mr. Fry's collection" (Walker, 1855b: 1107). I have been unable to locate the type, and it has apparently been lost since at least Hampson's time. Apparently many of the species described by Walker as being in the Fry collection "were in such condition that their acceptance was refused" when they were re-

turned to Fry (Dyar, 1905b: 359; also unpublished notes by Hampson in BMNH). Some type specimens from the Fry collection are now at UMO, but *A. ochracea* is not among them. Therefore, I am designating a neotype that is in keeping with the established use of *A. ochracea* (especially Orfila, 1961). A BMNH specimen has been selected as neotype because most other Walker types are at BMNH. A specimen from the type locality is also deposited in USNM.

Throughout most of its range, *Acraga ochracea* has two forms of the male genitalia: (1) valvae complex tip thin, pointed, and down-turned, and the paired posterior spines of the uncus short and stout (Fig. 188); and (2) valvae complex tip stout and blunt, and the uncus spines longer and more slender (Fig. 188, inset). It is possible that these are sibling species, but without information on females, immatures, and ecology, I prefer to recognize them as one species. The neotype has the first genitalic form.

The name *Acraga ochracea* has been frequently misidentified. The Costa Rica records of Druce (1887: 213) and Pittier and Biolley (1897: 29) apply to *Dalcerides* new species. The Mexico record of Druce (1898: 441) is *Dalcerides ingenta*. The Trinidad records of Kaye and Lamont (1927: 121) and Kirkpatrick (1954: 68) and the Colombia record of Genty *et al.* (1978: 354) apply to the *Acraga infusa* complex. I have seen no voucher specimens from the Venezuela records of Ballou (1945: 60, 104), Colombia record of Figueroa Potes (1977: 5), and the Ecuador records of Campos (1921: 54; 1931: 139). *Acraga ochracea* "race" *conda* (Dyar, 1910c: 116) is not related to *A. ochracea* but belongs in the *A. infusa* complex.

Acraga victoria, new species

Figures 97, 189; Map 20

Diagnosis. Appears somewhat intermediate between *Acraga ochracea* and *A. sexquicentaria*, distinguished from both by darker forewing color and gnathos shape (Fig. 189).

Adult Male (Fig. 97). Forewing length 11.5–12 mm. Entirely dull orange, with dorsal forewing orange-brown (darker than in any other *ochracea* group species). Genitalia as in Figure 189.

Adult Female. Unknown.

Type. Holotype male, MNRJ.

Type Locality. Brazil, Santa Catarina, São Joaquim, 1,400 m.

Host. Unknown.

Immatures. Unknown.

Flight Period. January.

Distribution (Map 20). Southern Brazil (known only from the type locality), in Warm Temperate Wet Forest Life Zone.

Material Examined. 5 males from type locality, 22–24-I-1983, V. O. Becker (holotype and paratypes, MNRJ, VOB, USNM, BMNH).

Discussion. The species name honors Vitor O. Becker, who collected this and many other new and interesting species of *Dalceridae*.

Acraga sexquicentaria (Orfila),
NEW COMB.

Figures 95, 96, 190, 244; Map 20

Acraga sp. n. Biezanko, 1961a: 3.

Dalargentina sexquicentaria Orfila, 1961: 254–255, figs. 1, 5, pl. 1, figs. 1, 2.—Biezanko *et al.*, 1966: 5; 1974: 124; 1978: 58.

Diagnosis. Differs from related species in male genitalia; gnathos split and paired posterior spines on uncus of medium length and thickness (Fig. 190).

Adult Male (Fig. 95). Forewing length 9–13 (usually 11–12) mm. Entirely orange. Dorsal forewing slightly darker than hindwing; slightly darker than forewing of *Acraga parana*, lighter than forewing of *A. victoria*. Genitalia as in Figure 190.

Adult Female (Fig. 96). Forewing length 15 mm. Colored as in male. Genitalia as in Figure 244.

Type. Holotype male, lost.

Type Locality. Argentina, Misiones, Parque Nacional Iguazú.

Host. *Citrus sinensis* (Linnaeus) Osbeck (Rutaceae) (Biezanko *et al.*, 1974: 124).

Immature Stages. Unknown.

Flight Period. January to May, August, October, and November.

Distribution (Map 20). Southern Brazil, northern Uruguay (Biezanko *et al.*, 1966), and northern Argentina (Orfila, 1961), in Subtropical Moist, Subtropical Lower Montane Moist, and Warm Temperate Moist Forest Life Zones.

Material Examined. 26 males and 2 females. BRAZIL: Minas Gerais: Fazenda dos Campos, [1,500 m], 16-I-1918, J. F. Zikan (IOC, 1 male); “Passa Quatro,” 1-II-1922, Zikan (ZSBS, 1 male); Rio Grande do Sul: Hamburgo Velho, [no date], C. Ertl (ZSBS, 1 male only); Pelotas, various dates 1951–1964, C. Biezanko (AMNH, BMNH, CMNH, CU, MCZ, USNM, ZSBS), 21-V-1939, R. Figueiredo (CU).

Discussion. As in the case of *Dalcer a haywardi* Orfila, inquiries to MBR, MLP, IML, and INTA failed to locate any type material of *Acraga sexquicentaria*. However, the original description is adequate to identify the species, which is almost entirely known from specimens collected by Biezanko at Pelotas. The year on the specimen in ZSBS from “Passa Quatro” is illegible: if it is 1921, then it was collected at Fazenda dos Campos; if 1922, then from Passa Quatro at 950 m.

Acraga parana, new species

Figures 98, 191; Map 20

Diagnosis. Very similar to *Acraga sexquicentaria*, differing in lighter and brighter orange forewings, solid (not bifid) gnathos, and stout paired posterior spines on the uncus (Fig. 191).

Adult Male (Fig. 98). Forewing length 11.5–14 mm. Entirely orange. Dorsal forewing slightly darker than hindwing; slightly lighter and “brighter” than forewing of *Acraga sexquicentaria*. Genitalia as in Figure 191.

Adult Female. Unknown.

Type. Holotype male, MNRJ.

Type Locality. Brazil, Paraná, Curitiba, 920 m.

Host. Unknown.

Immatures. Unknown.

Flight Period. April to June, September, and November to February.

Distribution (Map 20). Southern Brazil and Paraguay, in Subtropical Wet, Subtropical Moist, and Warm Temperate Moist Forest Life Zones.

Material Examined. 18 males (all paratypes). BRAZIL: *Paraná*: Banhado, Quatro Barras, 800 m, 27-XI-1971, 2S-XI-1970, V. O. Becker (VOB, USNM); Curitiba, 920 m, 6-14-I-1975, 28-XII-1974 (holotype), Becker (MNRJ, VOB, USNM); *Santa Catarina*: Jaraguá do Sul, IX-1932, F. H. Hoffmann (BMNH, USNM); *Santa Catarina*, 4-IV-1922, E. D. Jones (USNM); *São Paulo*: Alto da Serra, IV-1936, V-1927, V-1929, R. Spitz (BMNH, USNM); Ipiranga, V-1924, VI-1934, Spitz (BMNH); *São Paulo*, 2,300 feet [700 m], [no date], Jones (BMNH); PARAGUAY: *Alto Paraná*: Bella Vista, II-1938, Gassner (NHMV).

Discussion. The species name is a noun in apposition referring to the type locality.

Dalcerides Neumoegen and Dyar

Dalcerides Neumoegen and Dyar, 1893a: 121; 1893b: 98; 1894: 109, 111.—Dyar, 1895a: 14; 1898: 232; 1910c: 119.—Dyar and Strand, 1913b: 29.—Hopp, 1921: 282.—Sick, 1939: 1307.—D'Almeida, 1945: 194.—Fletcher and Nye, 1982: 48.—Davis, 1983: 67. Type species: *Artaxa ingenua* Hy. Edwards, 1882, by original designation.

Acragopsis Dyar, 1905: 176-177; 1910c: 120.—Dyar and Strand, 1913b: 30.—Hopp, 1921: 281.—Sick, 1939: 1308.—Forbes, 1942: 395.—D'Almeida, 1945: 193.—Fletcher and Nye, 1982: 3. Type species: *Acragopsis flavetia* Schaus, 1905, by original designation. NEW SYN.

Diagnosis. Forewing accessory cell and upper half of discal cell retracted (distal ends of cells not in line) (e.g., Figs. 43, 44); gnathos comblike (Figs. 192-197, 199-203).

Adult Male. Small to medium size, forewing 6-13 mm. Ground color: yellow, orange, or white, with maculation. Forewing: accessory cell present; accessory cell and especially upper half of discal cell retracted (i.e., distal ends of cells not in line); R_{2+3} and R_{4+5} arising from accessory cell or short-stalked; $R_2 + R_3$ very long-stalked or fused; $R_4 + R_3$ short-stalked; retinaculum present. Hindwing: Rs fused with, or free but running very close to, $Sc + R_1$ in cell; frenulum present. Genitalia: tegumen and sociuncus fused complex; sociuncus developed as two lobes with no processes;

socii not distinct, posterior lobes of sociuncus hairy; gnathos paired comblike sclerotized structures; vinculum elongate and narrow; valvae tab- or hooklike, fused into complex with juxta and vinculum; juxta not distinct; saccus medium to long in length and slender to medium in thickness; aedoeagus long and slender, external end sometimes pointed, bent, almost hooklike, and/or with minute spine near apex.

Adult Female. Medium size, forewing 8-16 mm. Genitalia: sterigma medium width; ostium bursae narrow to medium width; ductus bursae long, narrow to medium width, straight or with bends; corpus bursae ovate; ductus seminalis arising about middle of ductus bursae; apophyses posteriores medium to wide, short to medium length, narrowing to apex; "accessory glands" ovate in lateral view.

Discussion. As constituted here, *Dalcerides* includes several common small yellow species and the only North American species of Dalceridae. The smaller species placed here have traditionally been placed in *Acragopsis*, the larger species in *Dalcerides*. Although the two groups of species differ somewhat in size, fusion of the hindwing Rs with $Sc + R_1$ and male genitalia (development of uncus, gnathos, valvae complex, and aedoeagus tip), I do not consider these differences sufficient for generic status. *Zikanyrops* probably should be placed here also, but I do not want to synonymize it without seeing the male genitalia.

Dalcerides nana does not fit the preceding description because it has a large median point on the sociuncus and usually has the venation of *Acraga*. I tentatively place it here on the basis of other male genital structures.

The gnathos appears to be composed of both median processes and lateral arms; the median processes being comblike sclerotized structures connected by membrane, and the lateral arms also being comblike, either almost continuous with median processes or free with larger "teeth." As discussed previously, an alter-

native interpretation of the fusion of valvae was presented by Eyer (1924: 318).

KEY TO MALE *DALCERIDES*

(Male of *bicolor* unknown; new species from Costa Rica not included.)

- 1. Larger, forewing length ≥ 9 mm; hindwing Rs free, running close to, but not fused with, Sc + R₁ (e.g., Fig. 43) 1
- Smaller, forewing length ≤ 9 mm; hindwing Rs fused with Sc + R₁ in cell (Fig. 44) 4
- 2(1). Wings entirely orange (or shade thereof) (Fig. 111); Arizona and Mexico ... *ingenita*
Wings not entirely orange 3
- 3(2). Forewing orange red, hindwing fuscous (Fig. 110); Costa Rica *bicolor*
Wings white with maculation (Fig. 113); Central America *alba*
- 4(1). Forewing entirely yellow or orange, without maculation darker than ground color 7
Forewing not entirely yellow or orange 5
- 5(4). Forewing dominated by dark shade or spot that is surrounded or bordered with yellow 6
Forewing whitish with light brown pattern (Fig. 107) *sofia*
- 6(5). Forewing with yellow limited to base and inner margin (Fig. 102) *dulciola*
Borders around all or most of forewing shading into yellow (Fig. 105) *mesoa*
- 7(4). Forewing with pale line along end of discal cell (Fig. 109); sociuncus with strong median point (Fig. 202) *nana*
Forewing entirely yellow or orange; sociuncus without median point 8
- 8(7). Forewing ground color yellow-orange without silky luster and appearance of transverse bands 10
Forewing ground color yellow, yellow-orange, or golden yellow *with* silky luster and appearance of transverse bands 9
- 9(8). Forewing golden yellow; Mexico and Guatemala *chirma*
Forewing pale golden yellow; Brazil *radians*
- 10(8). Valvae developed in long hooks (Fig. 192); northern South America *flavetta*
Valvae weakly developed (Fig. 193); Costa Rica and Ecuador *rebella*

Dalcerides flavetta Species-Group

See discussion under *Dalcerides*, earlier.

Dalcerides flavetta (Schaus), NEW COMB.
Figures 44, 99, 100, 192, 249; Map 21

Acragopsis flavetta Schaus, 1905: 332.—Dyar, 1910c: 120.—Dyar and Strand, 1913b: 30.—Hopp, 1921: 281.

Acragopsis flavetta Dyar [sic].—Sick, 1939: 1308.

Diagnosis. Small yellow-orange species, wings lacking silky luster, distinguished from *Dalcerides rebella* by valvae developed as long hooks (Fig. 192).

Adult Male (Fig. 99). Forewing length 7–8.5 mm. Entirely yellow-orange, with forewing veins and dorsal body slightly darker than the rest. Genitalia as in Figure 192.

Adult Female (Fig. 100). Forewing length 10 mm. Colored as in male. Genitalia as in Figure 249.

Type. Holotype male, USNM 8908.

Type Locality. French Guiana, Maroni River, Saint-Jean.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Year-round.

Distribution (Map 21). Venezuela, Guyana, Surinam, French Guiana, Colombia, Ecuador, Peru, Bolivia, and northern Brazil. Recorded from Tropical Wet, Tropical Moist, Tropical Premontane Wet, Tropical Premontane Moist, Subtropical Moist Forest, Tropical Dry Forest transitional to Subtropical, Warm Temperate Dry transitional to Moist (Corumbá, Brazil), and maybe Tropical Lower Montane Moist Forest Life Zones.

Material Examined. 196 males and 3 females. BOLIVIA: *Cochabamba*: Chaparé-Gebiet Oberer Rio Chipiriri, 400 m, 6-IX-27-X-1953, W. Forster (ZSBS); Yungas del Espíritu Santo, 1888-1889, P. Germain (ZSBS); *Santa Cruz*: Buena Vista, VIII-1906-IV-1907, Steinbach (BMNH); "P. del Sara" [now Gutiérrez], XI-1912, XI-1913, J. Steinbach (CMNH); BRAZIL: *Amazonas*: Fonte Boa, V-VI-1906, S. M. Klages (BMNH); Manicoré, Rio Madeira, X-XI-[no year] (USNM); Reserva Ducke, Km 26 Manaus-Itacoatiara Highway, 17-V-1972, E. G. Munroe (CNC); Rio Cauaburi, ca. 60 m, 14-XII-1962, C. Lindemann (ZSBS); Rio Madeira, [no date], A. M. Moss (BMNH); Santo Antônio de Javari, VI-1907, Klages (BMNH); São Paulo de Olivença, IX-[no year], A. H. Fassl (ZSBS); Tefé,

23-XII-1919 (CMNH), IX-[no year], Fassl (USNM); *Goiás*: Formosa, 800 m, 19-III-1977, V. O. Becker (VOB); *Goiás Velho*, 500 m, 13-15-X-1984, Becker (VOB); 20 km N São João da Aliança, [ca. 1,000 m], 15-IV-1956, F. S. Truxal (LACM); *Mato Grosso do Sul*: Corumbá, 19-25-IV-1985, Becker (VOB); Rio Brilhante, 25-I-1971, 23-27-X-1970, Becker (VOB); *Minas Gerais*: Sete Lagoas, 720 m, 20-V-1974, Becker (VOB); Unai, 700 m, 7-XI-1982, Becker (VOB); *Pará*: Belém, 20 m, 1-1984, Becker (VOB); Capitão Poço, 19-22-XI-1984, Becker (VOB); Marabá, 50 m, 9-I-1977, Becker (VOB); Pará [=Belém], [no date], Moss (BMNH); Rio Guamá, 27-I-1914 (BMNH); Rio Iriri Camp, 52°40'W, 3°50'S, ca. 100 km S Altamira, 17-18-X-1986, P. J. Spangler & O. S. Flint (USNM); Rio Xingu Camp, 52°22'W, 3°39'S, ca. 60 km S Altamira, 1-21-X-1986, Spangler & Flint (USNM); Taperinha, 1-10-VII-1927, Zerny (NHMV); COLOMBIA: *Putumayo*: Mocoa, 530 m, 20-30-V-1922, W. Hopp (ZSBS); *Cauca*: Río [San Juan de] Micay, [no date], Hopp (ZSBS); ECUADOR: *Morona-Santiago*: 40 km NNE Macas, 1,020 m, 13-VI-1983, J. Rawlins & S. Thompson (CMNH); FRENCH GUIANA: Cayenne, VI-1904, W. Schaus (USNM); Godebert-Maroni, VI-[no year] (BMNH); Kourou River, II-1906 (BMNH); Pied Saut, II-1918, Klages (CMNH); Piste de la Montagne des Singes, Km 10, 150 m, 8-I-1985, J. F. Landry (USNM); Piste Nancibo, Km 6, 11-I-1985, Landry (USNM); Saint-Jean, VII-1904, Schaus (USNM, holotype), VII-VIII-1904 [and no date] (BMNH); Saint-Laurent, XII-[no year] (BMNH); 60 miles [100 km] up Maroni River, VIII-1904, Schaus (USNM); GUYANA: "Brit. Guiana," [no date], J. Rodway (BMNH); confluence of Oronoque & New Rivers, 650 feet [200 m], XI-XII-1937 (BMNH); Kartabu, 5-I-1921 (AMNH), VI-1925 (CMNH); New River, 750 feet [220 m], 20-I-23-III-1938, C. A. Hudson (BMNH); Rockstone, IX-1904, Schaus (USNM); PERU: *Amazonas*: [mouth of Río Cenipa], Upper Río Maraño, 21-IX-1929, H. Bassler F6030 (AMNH, 1 female only); *Cuzco*: Pilcopata, 600 m, 8-14-XII-1979, J. B. Heppner (FSCA, USNM); *Junín*: Río Colorado, 2,500 feet [750 m], VIII-IX-1902, Watkins (BMNH); Utcuyacu, 5,000 feet [1,500 m], XII-1919-II-1920, C. Watkins (BMNH); *Lima*: Callao, [no date], Mrs. M. J. Pusey (USNM) [locality probably incorrect]; *Loreto*: Lower Río Putumayo, 28-VIII-1920 (USNM); [Puerto Limon], Middle Río Maraño, 22-X-1928, Bassler F6076 (AMNH); Río Napo, 6-VI-1920 (CMNH); Río Pacaya, VII-IX-1912 (BMNH); *Madre de Dios*: Río Tambopata Reserve, 30 air km SW Puerto Maldonado, 290 m, 6-10-XI-1979, Heppner (USNM); *Puno*: La Oroya, Río Inambari, 3,100 feet [900 m], XI-XII-1905, G. R. Ockenden (BMNH); Tincuri, 3,400 feet [1,000 m], I-1905, Ockenden (BMNH); Yahuar Mayo, 1,200 feet [350 m], II-III-1912, H. & C. Watkins (BMNH); SURINAM: Aroewarwa Creek, Maroewym Valley, III-V-1905, Klages (BMNH); Moengo, Boven, Upper Cottica River, 16-27-V-1927, [W. T. M. Forbes] (CU, USNM); Paramaribo, VIII-1892, C. W. Ellacombe

(BMNH); VENEZUELA: *Aragua*: Rancho Grande, 1,100 m, 4-VII, 7-IX, 23-X-1967, 21-VII-1976 (UCV), 18-VI-1949, 17-VII-1946 (AMNH), 25-V-1967, L. Rodriguez (USNM), 15-31-VIII-1967, R. W. Poole (USNM); *Amazonas*: Cerro de la Neblina basecamp, 0°50'N, 66°9'44" W, 140 m, 21-II, 10-III-1984, D. R. Davis & T. McCabe (USNM); Culebra, 250 m, 9-13-III-1985 (UCV); Ocamo, 13-XI-1982, F. Guanchez (UCV); San Carlos de Río Negro, 25-VIII-1982, 7-13-XI-1982 (UCV); 6 km E San Carlos de Río Negro, 23-XI-1984, R. L. Brown (USNM); *Barinas*: Reserva Forestal de Ticoporo, 230 m, 3-10-IV-1966, 26-29-II-1968, F. Fernandez Y. & L. J. Joly (UCV, USNM); *Bolívar*: Río Surukum, Carretara Santa Elena-Icabaru, 850 m, 19-31-I-1985, Fernandez *et al.* (UCV).

Dalcerides rebella (Schaus),
NEW COMB.

Figure 193; Map 22

Anacraga rebella Schaus, 1911: 627-628.—Dyar and Strand, 1913b: 29.—Sick, 1939: 1307.

Diagnosis. Similar to *Dalcerides flavetata*, differing in more weakly developed valvae (Fig. 193).

Adult Male. Forewing length 7 mm. Dorsal forewing and thorax yellow orange, remainder of moth pale yellow. Genitalia as in Figure 193.

Adult Female. Unknown.

Type. Holotype male, USNM 17300.

Type Locality. Costa Rica, Banana River [Río Banano].

Host. Unknown.

Immature Stages. Unknown.

Flight Period. February, March, May, and July.

Distribution (Map 22). Costa Rica and Ecuador, in Tropical Wet and Premontane Wet Forest Life Zones (the Life Zones of Banana River and "am Turrialba" are unknown).

Material Examined. 5 males. COSTA RICA: Banana River, III-1907, W. Schaus (USNM, holotype); La Selva, 2 km SW Puerto Viejo, 29-V-1971, P. A. Opler (UCB); "am [=on Mount] Turrialba," 6-II-1934, F. Nevermann (ZSBS); ECUADOR: *Carchi*: Chical, 1-VII-1983, J. E. Rawlins (CMNH).

Dalcerides chirma (Schaus), NEW COMB.
Figure 194; Map 23

Acragopsis chirma Schaus, 1920: 150.—Hopp, 1921: 282.—Sick, 1939: 1308, pl. 168b.

Diagnosis. Similar to *Dalcerides radians*, but forewing color lighter, usually smaller, and shape of valvae differ (Fig. 194).

Adult Male. Forewing length 7–9 mm. **Head:** Pale yellow. **Thorax:** Dorsum golden yellow; venter pale yellow. Forewings golden yellow with silky sheen; scales arranged to give appearance of transverse undulating bands. Hindwings pale yellow. Ventral wings pale yellow. Legs pale yellow. **Abdomen:** Dorsum golden yellow, venter pale yellow. Genitalia as in Figure 194.

Adult Female. Unknown.

Type. Lectotype male, and 5 paralectotype males, here designated, USNM 22499.

Type Locality. Guatemala, Cayuga.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. May, June, and August.

Distribution (Map 23). Southern Mexico and Guatemala, in Tropical Moist and Subtropical Wet(?) Forest Life Zones.

Material Examined. 8 males. GUATEMALA: Cayuga, VI-[no year] (paralectotype), VIII-[no year] (lectotype and paralectotype), [no date] (3 paralectotypes), W. Schaus & J. Barnes (USNM); MEXICO: Veracruz: Huatusco, 1,300 m, 19–23-VIII-1981, V. O. Becker (VOB); Zacualpan, 29-V-1903 (ZSBS).

Dalcerides new species

Figures 101, 195; Map 23

Dalcera ochracea? of Druce, 1887: 213; Pittier and Biolley, 1897: 29 [misidentification].

Diagnosis. Similar to *Dalcerides chirma* but larger and male genitalia differ, especially in shape of valvae (Fig. 195).

Adult Male (Fig. 101). Forewing length 9–10 mm. Both specimens badly denuded. Forewings golden yellow dorsally, all other body surfaces apparently lighter yellow. Genitalia as in Figure 195.

Adult Female. Unknown.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Unknown.

Distribution (Map 23). Costa Rica.

Material Examined. 2 males. COSTA RICA: Irazú,

6,000–7,000 feet [1,800–2,100 m], [no date], H. Rogers (BMNH); Orosí, 1,200 m, [no date], A.H. Fassl (BMNH).

Discussion. Known only from two badly rubbed males.

Dalcerides radians (Hopp), NEW COMB.

Figures 103, 104, 196, 251; Map 24

Acragopsis radians Hopp, 1921: 281.—Sick, 1939: 1308, pl. 168b.

Diagnosis. A southern Brazilian species with golden yellow wings with a silky luster; differs from *Acraga flava* in smaller size, wing venation, and male genitalia (Fig. 196).

Adult Male (Fig. 103). Forewing length 7–10 mm. **Head:** Pale yellow. **Thorax:** Dorsum pale golden yellow; venter pale yellow. Forewings pale golden yellow with silky luster; scales arranged to give appearance of transverse undulating bands. Hindwings pale yellow. Ventral wings pale yellow. Legs pale yellow. **Abdomen:** Dorsum pale golden yellow, venter pale yellow. Genitalia as in Figure 196.

Adult Female (Fig. 104). Forewing length 10–11 mm. Colored as in male. Genitalia as in Figure 251.

Type. Lectotype male, here designated, ZMHB. Paralectotype male and female, not seen, ZMHB.

Type Locality. Brazil, Santa Catarina.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. September to May.

Distribution (Map 24). Southern Brazil, in Subtropical Wet, Subtropical Moist, and Warm Temperate Moist Forest Life Zones.

Material Examined. 59 males and 5 females. BRAZIL: *Espírito Santo*: [Baixo] Guandú, F. H. Hoffmann, I-1921 (ZSBS), X-1920 (NHMV); *Paraná*: Bandedo, Quatro Barras, 800 m, 26-III-1971, 28-XII-1970, V. O. Becker & Laroca (VOB); Castelhanos, Guaratuba, 22-III-1970, Becker (VOB); Castro, 950 m, [no date], E. D. Jones (BMNH); Guaraqueçaba, 9-XII-1970, Becker (VOB); *Rio de Janeiro*: Cachoeiras de Macacu, 400–800 m, 13–15-X-1985, S. E. Miller & Becker (USNM); “Campo Bello” [Itatiaia, 400 m], I, III-1927, III-1928, XII-1926, J. F. Zikan (BMNH, ZSBS); Imbarié, 50 m, 5-I-1956, H. Ebert (ZSBS); Itatiaia, 400 m, 13–15-III-1928, Zikan (ZSBS); [Ita-

tiaia, 400 m], various dates I-V, X, XII-1926-1941, Zikan (IOC); Nova Friburgo, 1,000 m, 14-X-1985, Miller & Becker (USNM); "Rio de Janeiro," XI, H. H. Smith (CMNH); *Rio Grande do Sul*: Rio Grande do Sul, [no date] (BMNH); *Santa Catarina*: Brusque, 100 m, 15-20-I-1983, Becker (VOB); Joinville, 100 m, 6-XII-1969, Becker (VOB); Nova Brémen, 8-III-1937, IV-1936, IV-1938, 12-18-V-1936, Hoffmann (BMNH, CU, NHMV, USNM); Nova Teutonia, [no date], F. Plaumann (USNM); "Sta. Catharina," 8-III-1907 [and no date], Hoffmann (USNM); "Sta Catharina," [no date], J. G. Scheidmantel (ZMHB, lectotype); *São Paulo*: Alto da Serra, II-1928, III-1925, IX-1929, XII-1922, R. Spitz (BMNH); Alto da Serra, Santos, 800 m, 26-II-1913, Jones (BMNH).

Dalcerides dulciola (Dyar),
NEW COMB.

Figures 102, 197; Map 25;
Color Plate, Figure 10

Anacraga dulciola Dyar, 1914: 252.—Sick, 1939: 1307, pl. 168f.—Biezanko, 1961a: 3.
Acragopsis dulciola:—Forbes, 1942: 395, fig. 126.

Diagnosis. Distinguished by brown wings, yellowish along forewing inner margin and hindwing costal area (Fig. 102).

Adult Male (Fig. 102). Forewing length 6–9 mm. **Head:** Pale yellowish brown. **Thorax:** Dorsum pale yellowish brown; venter whitish. Forewings brown with yellowish patch from base along inner margin, not reaching anal angle. Hindwings yellowish brown shading to brown on the margins (brown coverage varies, sometimes leaving yellow only along costal third). Ventral wings as dorsal, but duller. Legs whitish. **Abdomen:** Dorsum pale yellowish brown, venter whitish. Genitalia as in Figure 197.

Adult Female. Unknown.

Type. Holotype male, USNM 16099.

Type Locality. Panama, La Chorrera.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Year-round.

Distribution (Map 25). Southern Mexico, Costa Rica, Panama, northern Ecuador, and northern Venezuela. Recorded from Tropical Wet, Tropical Moist, Tropical Premontane Wet, and Tropical Premontane Rain Forest Life Zones. Palma Sola, Venezuela, is in Tropical Dry Forest

Life Zone, but includes gallery forests (Becker, 1982: 235).

Material Examined. 94 males. COSTA RICA: Fila Esquinas, 35 km S Palmar Norte, 150 m, 7–8-VI-1983, D. H. Janzen & W. Hallwachs (USNM); Finca San Gabriel, 650 m, 8-II, 11-XI-1983, Janzen & Hallwachs (USNM); Golfito, 1948, P. & D. Allen (MCZ); 2.8 miles [4.5 km] E Golfito, 3–4-VII-1967, O. Flint & Ortiz (USNM); Hamburg Farm, III, C. P. Dodge (MCZ); "am [on Mount] Turrialba," X-1929, III, IV-1932, F. Nevermann (ZSBS); Orosí, 1,200 m, [no date], A. H. Fassl (BMNH); 1.8 miles [3 km] W Rincón, Osa Peninsula, 19–21-II-1971, J. P. Donahue & C. L. Hogue (LACM); 4 km E Casetilla, Rincón Nat. Park, 750 m, 11-IV-1983, 14-VIII-1981, 18-X-1982, Janzen & Hallwachs (USNM); Rincón de Osa, 20 m, 10–14-XI-1972, V. O. Becker (VOB); Río Sarapiquí, 6 air km S San Miguel, 800 m, 27-V-1985, J. A. Powell & J. T. Doyen (UCB); Sirena, Corcovado Nat. Park, Osa Peninsula, 5–11-I-1981, Janzen & Hallwachs (USNM); Turrialba, 600 m, 17-II–17-III-1965, W. D. & S. S. Duckworth (USNM), 10-III-1973, VII-1981, 2-VII, 5-VIII, 20-IX-1971, Becker (VOB), 13-V-1985, Powell (UCB); ECUADOR: *Esmeraldas*: Río Cayapas, [no date], G. Flemming & R. Miketta (BMNH); Salinero, 350 feet [100 m], III-1901, Flemming & Miketta (BMNH); Zapallo Grande, Río Cayapas, 20-III-1968, R. W. Hodges (USNM); *Imbabura*: Paramba, 3,500 feet [1,000 m], II-1897, dry season, W. Rosenberg (BMNH) [Bristow, 1979, doubts the accuracy of this locality]; MEXICO: *Veracruz*: Est. Biol. Tuxtla, 11–16-VI-1981, Becker (VOB); PANAMA: Barro Colorado Island, 21-III-1941, 2-VII-1941, J. Zetek, 18–28-IV-1964, Duckworth (USNM), 12-II–12-III-1936, W. C. Wood (AMNH), 11-IV-1935, A. Friedman (CU), 26-I-[no year], 10-X–29-XI-1934, M. Bates (MCZ, CU), 8–25-VIII-1940, N. S. Scrimshaw (MCZ), 13–18-VII-1958, N. McFarland (LACM); Fort Clayton, 3-VII-1951, F. S. Blanton (USNM); La Chorrera, V-1912, A. Busck (USNM, holotype); Lino, 800 m, [no date], Fassl (USNM); Portobelo, XII-1912, G. F. Cleveland (USNM); VENEZUELA: *Barinas*: Reserva Forestal de Ticoporo, 230 m, 26–29-III-1968, F. Fernandez Y. & C. J. Rosales (UCV); *Carabobo*: Las Quiguas, Esteban Valley, [no date] (CMNH); *Falcón*: Palma Sola, 1896, Whytman (BMNH).

Discussion. I have seen no specimens to document Biezanko's (1961a: 3) record from Rio Grande do Sul, Brazil, and consider it a misidentification.

Dalcerides mesoa (Druce),
RESURRECTED COMB.

Figures 105, 106, 199, 250;
Map 26

Dalcera mesoa Druce, 1887: 213.—Kirby, 1892: 542.
Dalcerides mesoa:—Dyar, 1898: 232.

Anacraga mesoa:—Dyar, 1910c: 119.—Dyar and Strand, 1913b: 30.—Hopp, 1921: 281.—Sick, 1939: 1308, pl. 168b.

Acragopsis mesoa:—Forbes, 1942: 395.

Anacraga gugelmanni Dyar, 1916: 34.—Hoffmann, 1932: 146.—Beutelspacher, 1992: 145. NEW COMB., NEW SYN.

Diagnosis. Distinguished by large brown spot in middle of orange-yellow forewings (Fig. 105).

Adult Male (Fig. 105). Forewing length 6–8 mm. **Head:** Pale yellow. **Thorax:** Dorsum orange-yellow; venter pale yellow. Forewings orange-yellow with large brown spot (of varying size) covering most of middle of wing. Hindwings yellow-orange. Ventral wings as dorsal, but duller. Legs pale yellow. **Abdomen:** Dorsum yellow-orange, venter pale yellow. Genitalia as in Figure 199.

Adult Female (Fig. 106). Forewing length 8–11 mm. Colored as in male. Genitalia as in Figure 250.

Types. Lectotype female, here designated, BMNH, and paralectotype female, ZMHB (*mesoa*); holotype male, USNM 19278 (*gugelmanni*).

Type Localities. Panama, Bugaba, 800–1,500 feet [250–450 m] (*mesoa*); Mexico, Tabasco, Teapa (*gugelmanni*).

Host. *Paullinia bracteosa* Radlkofer (Sapindaceae) (Aiello lot 82-12).

Immature Stages. Undescribed.

Flight Period. Year-round.

Distribution (Map 26). Southern Mexico, Guatemala, Costa Rica, Panama, Colombia, Venezuela, and Ecuador, in Tropical Wet, Tropical Moist, Tropical Dry, Tropical Premontane Wet, (probably Tropical Premontane Rain), Subtropical Wet (?), and Subtropical Dry Forest Life Zones.

Material Examined. 27 males and 19 females. COLOMBIA: *Magdalena*: Onaca, Sierra Nevada de Santa Marta, 2,000 feet [600 m], [IX–X-1901], Engelke (BMNH); COSTA RICA: Finca Campana, 5 km NW Dos Rios, 750 m, 21-III-1985, D. H. Janzen & W. Hallwachs (USNM); Hacienda Tapezco, 29 km W Tortuguero, 40 m, 8–13-III-1978, J. P. Donahue *et al.* (LACM); Sirena, Corcovado Nat. Park, Osa Peninsula, 5–11-I-1981, Janzen & Hallwachs (USNM); Turrialba, 600 m, 2-VII, 5-VIII, 10-20-IX-1971, 20-

X-1972, V. O. Becker (VOB), 2–5-XI-1967, E. L. Todd (USNM); ECUADOR: *Esmeraldas*: Carondelet, [no date], G. Flemming & R. Miketta (BMNH); San Javier, Río Cachabí, 60 feet [20 m], [no date], Flemming & Miketta (BMNH); GUATEMALA: Cayuga, [no date] (USNM); Quiriguá, III-[no year], W. Schaus & J. Barnes (USNM); Volcán de Santa María, IV-[no year], Schaus & Barnes (USNM); MEXICO: *Campeche*: Escárcega, 85 m, 17–21-VI-1981, Becker (VOB); *Tabasco*: Tabasco, II-1912 (ZSBS); Teapa, III-1914, W. Gugelmann (USNM, holotype; AMNH); *Veracruz*: Córdoba, 13–25-VII-1966, J. S. Buckett (UCB), 12-VIII-1965, 14-X-1965, A. B. Lau (USNM); Est. Biol. Tuxtla, 11–16-VI-1981, Becker (VOB); Huatusco, [no date] (BMNH); Jalapa, [no date] (USNM); Los Tuxtlas area, seeps at "Las Cabanas," 8–15-V-1981, C. M. & O. S. Flint (USNM); Misantla, XI-1920 (ZSBS); Orizaba, [no date] (USNM); Zacualpan, 12-III-1903 (ZSBS); *Yucatán*: Chichén Itzá, 20-II-1954, E. C. Welling (CMNH), 16-IX-1952, J. & D. Pallister (AMNH); PANAMA: Barro Colorado Island, 17-VI-1935, A. Friedman (MCZ), 26-III-1982 as larva, pupated 7-IV-1982, eclosed 14-IV-1982, A. Aiello lot 82-12 (USNM); Bugaba, 800–1,500 feet [250–450 m], [1881–1883], G. C. Champion (BMNH, lectotype of *mesoa*); Volcán de Chiriquí, [no date], H. Ribbe (ZMHB, paralectotype of *mesoa*); VENEZUELA: *Tachira*: Río Frio, 600 m, 2–10-IX-1981, F. Fernandez Y. *et al.* (UCV).

Discussion. A very dark female from Cerro de la Neblina Basecamp, 0°50'N, 66°9'44'W, 140 m, Amazonas, Venezuela (4–12-II-1984, D. R. Davis & T. McCabe, USNM) is probably this species.

Dalcerides nana (Dognin),
NEW COMB.

Figures 109, 202; Map 21

Anacraga nana Dognin, 1920: 13.—Sick, 1939: 1308.

Diagnosis. Distinguished from other orange Acraginae by small size, pale line along end of forewing cell (Fig. 109), and single medial point of sociuncus (Fig. 202).

Adult Male (Fig. 109). Forewing length 7–8 mm. Entirely golden yellow, with hindwing lighter yellow. Pale line along end of forewing cell. Ventral wings lighter than dorsal. Genitalia as in Figure 202.

Adult Female. Unknown.

Type. Holotype male, USNM 103448.

Type Locality. Brazil, São Paulo.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. January, March, May, and December.

Distribution (Map 21). Southern Brazil, in Subtropical Wet and Subtropical Moist Forest Life Zones.

Material Examined. 22 males. BRAZIL: *Paraná*: Guaraqueçaba, 9-XII-1970, V. O. Becker (VOB); "Paraná," [no date], F. Johnson (USNM); *Santa Catarina*: Blumenau, [no date] (ZSBS); Brusque, 28-XII-1969, Becker (VOB); Hansa Humbolt [now Corupá], XII-1932, A. Maller (BMNH); Nova Brémen, Rio Laeiss, III-1936, XII-1935, 3-I-1937, 12-18-V-1936, 19-XII-1936, F. H. Hoffmann (BMNH, CU, USNM); *Santa Catarina*, 1-I-1937, Hoffmann (USNM); *São Paulo*: Anhangabaú, XI-XII-1926, R. Spitz (BMNH); "São Paulo," [no date] (USNM, holotype).

Discussion. Most specimens have the venation of *Acraga*, but one specimen (Nova Brémen, USNM) has the hindwing Sc + R₁ fused with Rs in the cell. The male genitalia differ from other *Dalcerides* in the strong posterior hooklike medial point of the sociuncus. The species may not belong in *Dalcerides*, but this seems to be the best place for it given current knowledge.

Dalcerides sofia (Dyar), NEW COMB.

Figures 107, 108, 200, 248; Map 27

Dalceres alba Druce, 1887: 213. [misidentification] (male only).

Anacraga sofia Dyar, 1910b: 268; 1910c: 120.—Dyar and Strand, 1913b: 30.—Sick, 1939: 1307.—Beutelspacher, 1992: 145.

Anacraga sororcula Dyar, 1927: 551.—Sick, 1939: 1307. NEW COMB., NEW SYN.

Anacraga phasma Dyar, 1927: 551.—Sick, 1939: 1308. NEW COMB., NEW SYN.

Diagnosis. Distinguished from other *Dalcerides* by whitish wings with light brown pattern (Fig. 107).

Adult Male (Fig. 107). Forewing length 6–9 mm. *Head*: Cream. *Thorax*: Dorsum cream with light brown; venter white. Forewings cream-colored with light brown suffusion, especially posterior half of wing (including inner margin), postmedially and subterminally; large medium brown spot distal to upper half of discal cell; tuft of

white scales distal to lower half of discal cell. Hindwings white. Ventral wings white with brown forewing discal spot. Legs white. *Abdomen*: White. Genitalia as in Figure 200.

Adult Female (Fig. 108). Forewing length 9–11 mm. Colored as in male. Forewing anal angle less developed. Genitalia as in Figure 248.

Types. Holotype female, USNM 13036 (*sofia*); lectotype male, 3 male and 2 female paralectotypes, here designated, USNM 40717 (*sororcula*); holotype female, USNM 40718 (*phasma*).

Type Localities. Mexico, Morelos, Cuernavaca (*sofia*); Guatemala, Cayuga (*sororcula*); Mexico, Sinaloa, "Venadio" (*phasma*).

Host. "Orchid" (USNM).

Immature Stages. Undescribed.

Flight Period. Year-round.

Distribution (Map 27). Southern Mexico, Guatemala, El Salvador, Nicaragua, and Costa Rica, in Tropical Moist, Tropical Dry, Tropical Premontane Wet, Subtropical Moist, Subtropical Dry, and Warm Temperate Wet Forest Life Zones.

Material Examined. 89 males and 17 females. COSTA RICA: Puntarenas, 5-XII-1972, V. O. Becker (VOB); Santa Rosa Nat. Park, various dates I, III, V–VII, XI, XII-1979–1985, D. H. Janzen & W. Hallwachs (USNM); Turrialba, 600 m, 10-IX-1971, Becker (VOB); "Costa Rica," 18-VIII-1929, F. Nevermann (ZSBS); EL SALVADOR: Lago Ilopango, near Apulo, 4–5-VII-1966, O. S. Flint & Ortiz (USNM); San Salvador, 600 m, I, VI-1960, X-1959, B. Bechyne (ZSBS); 13 km N San Salvador, 4-II-1965, W. D. Duckworth (USNM); GUATEMALA: Cayuga, IX (lectotype of *sororcula*), V, VI, VIII, IX, X-[no year], W. Schaus & J. Barnes (USNM, CMNH, includes paralectotypes of *sororcula*); Laguna Nisquaya, near Pijije, 4-VIII-1965, P. J. Spangler (USNM); MEXICO: *Campeche*: "Campeche," VII-1935, C. C. Hoffmann (USNM); "Champich," 24-VII-1935 (AMNH); Escárcega, 85 m, 17-21-VI-1981, Becker (VOB); *Chiapas*: El Sumidero, 15 miles [24 km] NW Tuxtla Gutiérrez, 1-VIII-1957, J. A. Chemsak (UCB); El Zapotal, 2 miles [3 km] S Tuxtla Gutiérrez, 1-VII-1957, Chemsak (UCB); Teopisca, 1,900 m, 23–26-VI-1981, Becker (VOB); Villa las Rosas, 1,300 m, 27-VI-1981, Becker (VOB); *Morelos*: Chiconcuac, 26-X-1974, J. White (AJW); Cuernavaca, VIII-1906, Schaus (USNM, holotype of *sofia*), VI, X-1914 (ZSBS); *Nayarit*: 1 mile [1.6 km] S Huajicori, 22-VII-1984, Bloomfield & Faulkner (SDNH);

San Luis Potosi: El Pujal, VII-18-1939, R. Haag (MCZ); 2 miles [3 km] N Tamazunchale, 16-18-VII, 2-VIII-1963, D. R. Davis & Duckworth (USNM); 25 miles [40 km] N Tamazunchale, 26-VI-1965, Flint (USNM); *Sinaloa*: Presidio de Mazatlán, [no date], Forrer (BMNH, misidentified syntype of *alba*); "Venadio," [1918], [J. A. Kusche] (USNM, holotype of *phasma*); 5 miles [8 km] W Concordia, 2-XI-1961 (CMNH, USNM); 5 miles [8 km] N Mazatlán, 24, 28-VII-1964, J. A. Powell (UCB, USNM); 10 miles [16 km] S Rosario, 22-VI-1957, Chemsak (UCB); 18 miles [29 km] N Mazatlán, 29-X-1961 (CMNH); 27 miles [40 km] E Villa Unión, 800 feet [250 m], 26-VII-1964, Powell (UCB); *Veracruz*: Misantla, IX-1910, R. Müller (USNM, paralectotype of *sororcula*); Fortín [de las Flores], "Rf. orchid leaf," "29-XII-1954," Cary (USNM); 7 miles [11 km] SW Poza Rica, 200 feet [60 m], Davis & Duckworth (USNM); Puente Nacional, 6 miles [10 km] SE Rinconada, 29-IX-1975, Powell (UCB); Zacualpan, VIII-1916 (AMNH); *Yucatán*: Chichén Itzá, 11-I-1954, E. C. Welling (CMNH); *Not located*: "Mexico," C. H. T. Townsend (CMNH); *NICARAGUA*: Puerto Cabezas, 30-VI-1972, Becker (VOB).

Discussion. The male syntype of *Dalcerides alba* (Druce) (from Presidio de Mazatlán, Sinaloa, Mexico) is not conspecific with the lectotype of *D. alba* but is with *D. sofia*.

Although the unique holotype of *D. phasma* is in very poor condition, I am provisionally synonymizing *D. phasma* under *D. sofia*, because I can find no significant differences between the holotype of *D. phasma* and *D. sofia*. The apophyses posteriores of the *D. phasma* holotype are broader and blunter (Fig. 248, inset) than those of the other four female *D. sofia* dissected, but there is considerable variation in the apophyses posteriores of those specimens. "Venadio," the type locality of *D. phasma*, refers to El Venadillo, a town some 6.5 km north of Mazatlán airport (Cohn, 1965: 43; Nutting and Gurney, 1961: 52).

Dalcerides ingenita Species-Group

See discussion under *Dalcerides*, earlier.

Dalcerides ingenita (Hy. Edwards)

Figures 8-11, 14-16, 23, 24,
43, 48, 111, 112, 203, 253;

Map 28

Artaxa ingenita Hy. Edwards, 1882: 12.—Grote, 1882: 18.

Dalcerides ingenita:—Neumoegen and Dyar, 1893a: 121; 1894: 111.—Holland, 1903: 369-370.—Smith, 1903: 83.—Dyar, 1903: 359; 1910c: 119; 1925: 46.—Bureau of Entomology, 1907: 515.—Dyar and Strand, 1913b: 29.—Barnes and McDunnough, 1917: 127.—Hopp, 1921: 282.—Eyer, 1924: 318, pl. XXXVIII, fig. 3.—Comstock, 1925: 606.—Sick, 1939: 1307, pl. 168a.—McDunnough, 1939: 7.—Comstock, 1959: 53.—Davis, 1983: 67.—Papp and Swan, 1984: 119.—Arnett, 1985: 563, fig. 27.163.—Stehr and McFarland, 1985: 35-36; 1987: 460-462, fig. 26.185.—Beutelspacher, 1988: 328, fig. 1; 1992: 145.—McFarland, 1993: 2.

Dalcera ochracea of Druce, 1898: 441 [misidentification].

Diagnosis. Distinguished from other *Dalcerides* by larger size and orange coloration (Figs. 111, 112); distinguished from orange *Acraga* by wing venation (Fig. 43) and genitalia (Figs. 203, 253).

Adult Male (Fig. 111). Forewing length 9-13 mm. Entirely orange. Hindwing sometimes slightly richer in color than forewing. Genitalia as in Figure 203.

Adult Female (Fig. 112). Forewing length 12-16 mm. Colored as in male, but lighter and less rich (more yellowish) in shade. Genitalia as in Figure 253.

Type. Holotype female [not male as cited by Edwards], USNM 34165.

Type Locality. United States, Arizona, Yavapai County, Prescott.

Host. *Arctostaphylos pungens* HBK (Ericaceae) (USNM, foodplant cited but not identified by Dyar; Stehr and McFarland, 1987); *Quercus emoryi* Torrey and *Quercus oblongifolia* Torrey (Fagaceae) (N. McFarland, personal communication, 1985). In the laboratory it can be reared on some other Ericaceae, such as blueberry (*Vaccinium* sp.; Stehr and McFarland, 1987).

Immature Stages. Dyar (1910c: 119; 1925: 46), Comstock (1959: 53), Stehr and McFarland (1985, 1987).

Flight Period. Late April to September (Arizona) and July to December (Mexico).

Distribution (Map 28). Arizona (south-eastern Arizona north through the mountains to Flagstaff), southwestern Texas, and Mexico. Life Zone maps are not available for the range of *D. ingenita*, but it apparently occurs in Subtropical Moist (?),

Subtropical Dry, Warm Temperate Moist (?), Warm Temperate Dry, and Warm Temperate Thorn Steppe Life Zones.

Material Examined. Over 70 males and 160 females. UNITED STATES: *Arizona* [only localities listed here, based on AMNH, BMNH, CAS, LACM, MCZ, PMY, UCR, USNM, ZSBS]: Cochise County: Ash Canyon, Huachuca Mtns., 1,500 m; Carr Canyon, Huachuca Mtns.; Cave Creek Ranch, Portal; Cochise Stronghold Campground, Dragoon Mtns.; Copper Canyon, ca. 900 m; Fort Huachuca; Garden Canyon, Huachuca Mtns.; Hereford; Palmerlee; Paradise; Ramsey Canyon, Huachuca Mtns.; Sierra Vista; Southwest Research Station, Chiricahua Mtns.; Yaqui Canyon area, 1,600–1,700 m; 1.6 km S Portal; Coronino County: Miller Canyon; Sycamore Rim; Todd's Lodge, Oak Creek Canyon; Gila County: "Gila Co."; Globe; Kohls Ranch; Payson; Mohave County: "Mohave Co."; Pima County: Babaquivera Mtns.; Brown's Canyon, east slope Babaquivera Mtns., 1,140 m; Mount Lemmon, Molino, Tucson; Pinal County: Oracle; Santa Cruz County: Box Canyon, Santa Rita Mtns.; Canelo; Madera Canyon, Santa Rita Mtns., 1,500 m and no elevation; Pena Blanca, 1,200 m; 6.5 km N Nogales; Yavapai County: Dewey; Granite Dells, 6.5 km N Prescott; Mayer; Prescott; Rio Verde Mtns., Phoenix; Not located: "Arizona"; "So. Arizona"; *Texas*: Brewster County: Alpine, 1–7-VIII-1926, O. C. Poling (USNM, 2 females only); *MEXICO*: *Colima*: Colima, VIII-1919 (ZSBS), 9–XII-1915 (AMNH); *Guerrero*: Aguas de Obispo, 21–22-X-1973, V. O. Becker (VOB); Balsas, 1,500 feet [450 m], VIII-1906, W. Schaus (USNM); "Guerrero," XII-1913, XII-1915 (ZSBS), XII-1924 [?], Draudt (USNM); "Sierra de [=mountains of] Guerrero," VIII-1911, R. Müller (USNM); *Tierra Colorada*, 2,000 feet [600 m], [no date], H. H. Smith (BMNH); Zihuatenejo, 28-XI-1939, S. H. & A. H. Rindge (AMNH); *Jalisco*: Guadalajara (USNM); *Volcán de Colima*, IX-1916, IX-1924, X-1923, X-1928, XI-1918, XII-1928, Müller (ZSBS); *México*: San Nicolas, 1-IX-1962 (RJM); *Nayarit*: Maria Magdalena Island, Tres Marias Islands, 15-XII-1939, Rindges (AMNH); 5.7 miles [9 km] N Huajicori, 26-VII-1984, Bloomfield & Faulkner (SDNH); 8 miles [13 km] E San Blas, 29-VIII-1961, D. Verity (LACM); 24 miles [38 km] SE Tepic, 4,100 feet [1,200 m], 27-VII-1971, E. M. Fisher (LACM); *Oaxaca*: Tangola, 8-XII-1937 (AMNH); *Puebla*: 2 miles [3 km] SW Tehuacán, 5,300 feet [1,600 m], 4-X-1975, J. A. Powell (UCB); *Sinaloa*: "Venadio," [no date] (BMNH, USNM); 5 miles [8 km] W Concordia, 2-XI-1961 (CMNH); 5 miles [8 km] N Mazatlán, 27-VII-1964, Powell (UCB); *Veracruz*: Zacualpan, IX-1915 (AMNH), X-1919 (ZSBS); *Not located*: "Mexico," 22-IX-1917 [and no date] (ZSBS); "Southern Mexico," Townsend (CMNH).

Discussion. This species is extremely variable in size; the smallest I have seen is one male from Maria Magdalena Island,

Tres Marias Islands, Mexico, with a 7.5-mm forewing.

Noel McFarland has observed this species since 1979 at his home in Ash Canyon, southeastern Huachuca Mountains, Cochise County, Arizona (1,500 m, oak woodland and manzanita scrub). He reports (pers. comm., 1985) that *Dalcerides ingenta* is common every year in Ash Canyon, with two flights per year: a smaller brood from mid-May to mid-June and a larger brood from late July to the end of September (peak abundance mid-August to early September). Females are strictly nocturnal and come readily to blacklight throughout the night. Males come to blacklight primarily after midnight and fly actively until about an hour after sunrise.

In Arizona *Dalcerides ingenta*, along with the superficially similar geometrid *Eubaphe unicolor* (Robinson), is part of a mimetic complex modeled on *Lycus loripes* (Chevrolat) and *Lycus simulans* Schaeffer (Coleoptera: Lycidae) (Linsley *et al.*, 1961). Although *D. ingenta* was not discussed by Linsley *et al.* (1961), McFarland (personal communication, 1986) confirmed that *D. ingenta* fits the complex in behavior as well as appearance.

Dalcerides bicolor Schaus

Figures 110, 252; Map 22

Dalcerides bicolor Schaus, 1910: 415.—Dyar and Strand, 1913b: 29.—Sick, 1939: 1307.

Diagnosis. Easily distinguished by striking color pattern with forewing lighter than hindwing (Fig. 110).

Adult Male. Unknown.

Adult Female (Fig. 110). Forewing length 15 mm. **Head:** Orange red. **Thorax:** Orange red. Forewings orange-red, with veins slightly darker; narrow, with apex produced. Hindwings fuscous, thinly scaled. Ventral wings as dorsal. Legs orange-red. **Abdomen:** Dorsum fuscous, venter orange-red. Genitalia as in Figure 252.

Type. Holotype female, USNM 16952.

Type Locality. Costa Rica, Mount Poás [Volcán de Poás].

Host. Unknown.

Immature Stages. Unknown.

Flight Period. May.

Distribution (Map 22). Costa Rica.

Discussion. *Dalcerides bicolor* is known only from the unique holotype.

Dalcerides alba (Druce), NEW COMB.

Figures 113, 114, 201, 243;

Map 29; Color Plate, Figure 7

Dalcera alba Druce, 1887: 213.—Kirby, 1892: 542.—Dyar, 1898: 231.

Dalcera? alba:—Dyar and Strand, 1913b: 27.—Sick, 1939: 1304.—Hopp, 1921: 280.

Acraga caretta Dyar, 1910b: 268; 1910c: 118; 1914: 252.—Dyar and Strand, 1913b: 29.—Hoffmann, 1932: 146; 1933: 295.—Sick, 1939: 1306.—Forbes, 1942: 394.—Beutelspacher, 1992: 145. NEW COMB., NEW SYN.

Diagnosis. Similar to *Acraga ampela*, distinguished by smaller size and brown forewing anal angle (Fig. 113).

Adult Male (Fig. 113). Forewing length 9–11 mm. *Head*: White. *Thorax*: Dorsum white with light brown stripes along wing bases; venter white. Forewings white; brown submarginal shading, well developed (including outer margin) near anal angle, becoming faint and finally lost toward apex; cross veins of discal cell and origins of CuA_1 and CuA_2 brown. Hindwings white with brown anal angle. Ventral wings white with brown anal angles. Legs white. *Abdomen*: White. Genitalia as in Figure 201.

Adult Female (Fig. 114). Forewing length 13–16 mm. Colored as in male, although generally lighter. Brown very reduced at hindwing anal angle. Genitalia as in Figure 243.

Types. Lectotype female, here designated, BMNH (*alba*) [male syntype is *Dalcerides sofia* (Dyar)]; Lectotype male, and paralectotype female, here designated, USNM 13037 (*caretta*).

Type Localities. Guatemala, Volcán de Atitlán, 2,500–3,500 feet [750–1,000 m] (*alba*); Panama, Chiriquicito (*caretta*).

Host. *Colubrina* sp. (Rhamnaceae) (USNM).

Immature Stages. Undescribed.

Flight Period. Year-round.

Distribution (Map 29). Southern Mexico, Guatemala, Honduras, Belize, Costa Rica, Panama, Colombia, and Ecuador, in Tropical Wet, Tropical Moist, Tropical Dry, Tropical Lower Montane Wet or Moist, Tropical Premontane Wet, Tropical Premontane Moist, Subtropical Wet, and Subtropical Moist Forest Life Zones.

Material Examined. 117 males and 27 females. BELIZE: Punta Gorda, VI, VII, IX-1933, VIII-1934, IX, X, XII-1935, J. J. White (BMNH); COLOMBIA: Cauca: Río [San Juan de] Micay, [no date], W. Hopp (ZSBS); COSTA RICA: Fila Esquinas, 35 km S Palmar Norte, 150 m, 7–8-I-1983, D. Janzen & W. Hallwachs (USNM); Fina San Gabriel, 650 m, 11-XI-1983, Janzen & Hallwachs (USNM); Guápiles, XI-[no year] (BMNH, CMNH); Hacienda La Suerte/Tepezco, 29 km W Tortuguero, 40 m, 13–31-VIII-1979, J. P. Donahue *et al.* (LACM); Hamburg Farm, III-[no year], C. P. Dodge (MCZ); Hamburg Farm, Reventazon, 25 m, II, V-1923, VI-1932, VII-1924, F. Nevermann (NHMV, ZSBS); La Selva, 2 km SW Puerto Viejo, 29-V-1971, P. A. Opler (UCB); San José, II-III-1926, Nevermann (ZSBS), VI-1923, H. Schmidt (BMNH); Sirena, Corcovado Nat. Park, 5–11-I-1981, Janzen & Hallwachs (USNM); Sixaola River, III-[no year], W. Schaus (BMNH); Tuis, VI-[no year], Schaus & J. Barnes (USNM); Turrialba, on *Colubrina* sp., pupated 12-I-1970, emerged 14-I-1970 (USNM); Turrialba, 600 m, many specimens, IV–X-1971–1973 and VII-1981, V. O. Becker (VOB); “am [=on Mount] Turrialba,” I–II, IV–VIII-1929–1934, Nevermann (ZSBS); ECUADOR: Cañar: 20 km SE La Troncal, 2,200 feet [660 m], 8–21-VII-1984, S. J. Weller & N. L. Jacobson (USNM); Esmeraldas: Salinero, 350 feet [100 m], II-1901, G. Flemming & Miketta (BMNH); GUATEMALA: Cayuga, II–X, XII-[no year], Schaus & Barnes (BMNH, CMNH, USNM); “La Naranja,” [no date] (ZSBS); Machaquila, Petén, 9-VII-1972, Becker (VOB); “Querifilia,” IV-[no year] (BMNH); San Sebastián, Retalhuleu, [no date] (USNM); Volcán de Atitlán, 2,500–3,500 feet [750–1,000 m], [XII-1880], G. C. Champion (BMNH, lectotype of *alba*); HONDURAS: La Cumbre, 3–25-II-1922, J. Lienhart (BMNH); MEXICO: Campeche: Escárcega, 85 m, 17–21-VI-1981, Becker (VOB); Chiapas: Chiapas, V-1915 (ZSBS); “La Granja,” [600 m], VI-1930 (AMNH); Maravillas, 30-IX-1929 (AMNH); Distrito Federal: Mexico City, II-1922, R. Müller (BMNH); Veracruz: El Palmar, 29-VI-1948, A. C. Smith (USNM); Est. Biol. Tuxtla, 15–16-VI-1981, Becker (VOB); Fortín de las Flores, 1,010 m, 7–16-VII-1974, J. A. Powell *et al.* (UCB); Huatusco, [no date] (BMNH); Jalapa, XI-1910 (ZSBS); Misantla, VI-1909, Müller (USNM, paralectotype of *caretta*), VII-1911, Gugelmann (AMNH), IX-1914 (USNM), VI-1912 (ZSBS), VII-[no year] (BMNH); Orizaba, IX-1912, IX-1913, XI-1911 (ZSBS); Vera-

cruz, I-1883, H. H. Smith (BMNH); *Yucatán*: Chichén Itzá, 26-X-1954, E. C. Welling (CMNH); PAN-AMA: Barro Colorado Island, 20-II-1935, 9-IV-1935, A. Friedman, 20-VII-1940, N. S. Scrimshaw, 23-XI-1934, 9-XII-1934, M. Bates (MCZ); Chiriquito, III-[no year], Schaus & Barnes (USNM, lectotype of *ca-retta*); Portobelo, 7-24-IV-1912, A. Busck (USNM).

Discussion. The brown coloration on the forewing varies from dark fuscous to light brown. A specimen from Veracruz (I-1883, H. H. Smith) bears a *Dalcera alba* "co-type" label, but it was not mentioned in the original description, so it is not a type.

Zikanyrops Hopp

Zikanyrops Hopp, 1928a: 286.—Sick, 1939: 1310.—Fletcher and Nye, 1982: 172. Type species: *Zikanyrops sparsa* Hopp, 1928a, by original designation.

Diagnosis. Very close to *Dalcerides*, differing in wing venation (Fig. 46); male genitalia unknown.

Adult Male. (Modified from Original Description). Small, forewing 8.5 mm. Frons scarcely as broad as one eye. Labial palpi narrow, slightly upturned. Forewing with 1A + 2A and CuP arising from base; CuA₂ from middle of vein of cell; CuA₁ from a little before the cell angle; M₃ from the cell angle; M₂ from a little in front of the media; M₁ from close behind the media; R₅ from the accessory cell; R₄ absent [not in *dubiosa*]; R₃ from accessory cell; R₂ absent; R₁ from costal margin of accessory cell; Sc free from base; discal cell rather broad, divided by the media into almost equal halves of which the outer margin is slightly indented; accessory cell small and (in *sparsa*) of rhombic shape, half of it projecting toward the outer margin; retinaculum absent. Hindwing with anals and CuP arising from base; CuA₂ from the discal third of cell; CuA₁ and M₃ from cell angle and nearly pedunculate [not in *dubiosa*]; M₂ a little in front of M₁ which is behind the media; Rs from anterior cell angle; Sc close beside Rs, from the cell [Sc and Rs fused in cell in *dubiosa*].

Adult Female. Medium size, forewing 12 mm. As in male, but see earlier and description of *Zikanyrops dubiosa* for dif-

ferences. Genitalia: sterigma Y-shaped, broad, and sclerotized; ostium bursae narrow; ductus bursae narrow, long, with bend at about first third; corpus bursae elongate ovate; ductus seminalis arising near bend in ductus bursae; apophyses posteriores very wide at base, narrowing to apex, short; "accessory glands" ovate.

Discussion. This genus is known only from two species, *Zikanyrops sparsa* known from a single male (now lost) and *Z. dubiosa* from a single female. The male genitalia and details of the male frenulum and retinaculum are unavailable.

Zikanyrops dubiosa Hopp Figures 46, 86, 254; Map 30

Zikanyrops dubiosa Hopp, 1928a: 287.—Sick, 1939: 1310–1311.

Diagnosis. Coloration distinctive; ground color yellow ochre, with anterior portion of forewings pink with fuscous touch (Fig. 86).

Adult Male. Unknown.

Adult Female (Fig. 86). Forewing length 12 mm. **Head:** Yellow ochre (labial palpi missing). **Thorax:** Yellow ochre. Forewings yellow ochre posterior of cell and CuA₁, anterior pink with fuscous touch; slightly falcate. Hindwings yellow ochre. Ventral wings colored as dorsal, but duller. Legs yellow ochre. **Abdomen:** Yellow ochre. Genitalia as in Figure 254.

Type. Holotype female, ZMHB.

Type Locality. Bolivia, Cochabamba, Yungas del Espíritu Santo, 1888–1889, P. Germain.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Unknown.

Distribution (Map 30). Bolivia.

Material Examined. Known only from unique type, in poor condition.

Discussion. *Zikanyrops dubiosa* differs, according to Hopp, from the unique male type of *Zikanyrops sparsa* in wing venation. The forewing accessory cell is somewhat narrower and does not project half-

way toward the outer margin, but it is simply a section of the anterior part of the cell. *Zikanyrops dubiosa* appears to have a frenulum base similar to that of a female *Dalcerides*, but it is obliterated by glue. The Río Espírito Santo is a headwater to the Río Chaparé, but I have not located Yungas del Espírito Santo.

Zikanyrops sparsa Hopp

Map 30

Zikanyrops sparsa Hopp, 1928a: 287.—Sick, 1939: 1310.

Diagnosis. Ground color creamy white, forewing sprinkled with dark brown scales; known only from original description.

Adult Male. Forewing length 8.5 mm. **Head:** Creamy white. Labial palpi brownish. **Thorax:** Creamy white. Forewings creamy white, delicately sprinkled with dark brown scales, especially between apex and cell; transverse vein of cell and veins M_1 and M_2 with white hairs. Hindwings creamy white. Ventral wings creamy white [?], basal half of forewing costa dark brown. Legs creamy white, one side of foreleg femora and tibiae dark brown. **Abdomen:** Creamy white. [Genitalia unknown.]

Adult Female. Unknown.

Type. Holotype male, originally in Hopp collection, now lost.

Type Locality. Brazil, Minas Gerais, "Passa Quatro," 26-XI-1917, J. F. Zikan.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. November.

Distribution (Map 30). Southern Brazil, in Subtropical Lower Montane Moist Forest Life Zone.

Discussion. I have not seen this species and cannot locate the unique type. The preceding description is taken from the original description. The type was collected at Fazenda dos Campos, 1,500 m, near Passa Quatro. The site was, at that time, *Araucaria* forest, but almost all of the region has now been deforested (W. Zikan, personal communication, 1985).

Subfamily Dalcerinae

Diagnosis. Distinguished from Acraginae by absence of the forewing accessory cell (Figs. 47, 49–56).

Discussion. This subfamily includes *Minonnoa*, *Paracraga*, *Ca*, *Minacragides*, *Oroya*, *Dalcera*, *Dalcerina*, and *Minacraga*. Orfila (1961: 252) based his diagnosis of the subfamily, in part, on the presence of apical scale tufts on the male antennae, but only *Dalcera*, *Dalcerina*, and *Minacraga* possess this synapomorphy. *Oroya* differs significantly from the other genera in several characters of wing venation and male genitalia, but because *Oroya* is known only from males of one species it seems best to leave it in Dalcerinae. For further discussion, see Discussion of cladogram.

Minonnoa Dyar

Minonnoa Dyar, 1905a: 176; 1910c: 120.—Dyar and Strand, 1913b: 30.—Hopp, 1921: 277.—Sick, 1939: 1308.—D'Almeida, 1945: 195.—Fletcher and Nye, 1982: 103. Type species: *Minonnoa perbella* Schaus, 1905, by original designation.

Diagnosis. Fuscous with distinctive white, yellow, or orange patterns (Figs. 125–128); forewing R_1 free, R_{2+3} fused, R_{4+5} fused, and hindwing frenulum present (Fig. 53).

Adult Male. Medium size, forewing 11 mm. Ground color: Fuscous and white with maculation. Antennae: apical scale tuft absent. Forewing: accessory cell absent; R_{2+3} and R_{4+5} short-stalked basally; R_{2+3} fused; R_{4+5} fused; retinaculum present. Hindwing: R_s fused with $Sc + R_1$ in cell; frenulum present. Genitalia: tegumen and sociuncus fused complex; anal tube opening in shelflike subscaphium; socii not distinct, but sociuncus lobes hairy; gnathos a thin plate parallel to ventral surface of sociuncus; vinculum long and narrow; valvae reduced to lateral lobes of valvae-vinculum-juxta complex; juxta not identified internally; projection from valvae complex externally; saccus present but very reduced; aedeagus medium length and stout.

Adult Female. Medium size, forewing

10–14 mm. Genitalia: sterigma broad; ostium bursae broad; ductus bursae broad to bend, narrowing and becoming membranous; corpus bursae elongate ovate; ductus seminalis arising after bend; apophyses posteriores wide and short to thin and long; “accessory glands” ovate in lateral view.

Discussion. My identification of forewing radial veins in *Minonoa* and *Paracraga* is based on the tendency for R_1 to be separate from the others in dalcerids, and the scenario of wing evolution in which the *radius anterior* forms R_1 and the *radius posterior* forms R_{2-5} (Kukalová-Peck, 1983; Lawrence *et al.*, 1991: 15–16). However, the homologies of the veins and the role of cross-veins are uncertain.

KEY TO MINONOA

1. Hindwing entirely dark fuscous (Fig. 127) *pachitea*
Hindwing at least half yellow, orange, or white (Figs. 125, 126, 128) 2
2. Forewing simply bicolored, dark fuscous and yellow or white (Figs. 125, 126) *elvira*
Forewing multicolored with complex pattern (Fig. 128) *perbella*

Minonoa elvira (Dognin)

Figures 53, 125, 126, 205, 256;
Map 31

Acraga elvira Dognin, 1909: 233.—Sick, 1939: 1306.
Acraga? elvira:—Dyar and Strand, 1913b: 29.
Minonoa elvira:—Dyar, 1927: 551.

Diagnosis. Distinguished by the white or yellow markings on both forewings and hindwings (Figs. 125, 126).

Adult Male (Fig. 125). Forewing length 11 mm. **Head:** Vertex and frons and antennae dark fuscous with intermixed white scales. Labial palpi white. **Thorax:** Dorsum dark fuscous with white; venter white. Forewings dark fuscous, except triangle pointing forward with side on inner margin; triangle is yellow with white proximally. Hindwings white-edged with dark fuscous (1–2 mm wide) around margins. Ventral wings: forewing dark fuscous suffused with white in center and inner margin; hindwing as dorsal but dark fuscous

margin reduced around anal angle. Legs white. **Abdomen:** Dorsum dark fuscous with white, venter white. Genitalia as in Figure 205.

Adult Female (Fig. 126). Forewing length 14 mm. Body dark fuscous with legs white. Forewings (dorsal and ventral) yellow with broad (2–3 mm) dark fuscous costal margin and narrow brown outer margin. Hindwing (dorsal and ventral) with broad yellow central band from base almost to anal angle; broad dark fuscous marginal bands on either side of yellow. Genitalia as in Figure 256.

Types. Lectotype male, paralectotype male and female, here designated, USNM 29808.

Type Locality. Colombia, Valle del Cauca, Villa Elvira, 1,600 m.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. June to August.

Distribution (Map 31). Colombia.

Material Examined. 3 males and 1 female. COLOMBIA: *Valle del Cauca:* Villa Elvira, 1,600 m, 20-VII-1908, A. H. Fassl (USNM) (lectotype and paralectotype); Villa Elvira, 1,800 m, 24-VIII-1908, Fassl (USNM) (paralectotype female); Alto de Las Cruces, 2,200 m, VI-1909, Fassl (USNM).

Discussion. I cannot accurately locate the localities. They were apparently on the road between Cali and Buenaventura and probably in Tropical Lower Montane and Premontane Wet Forest Life Zones. The bodies of the types are partly denuded of scales, so coloration is uncertain.

Minonoa pachitea Hopp

Figures 127, 255; Map 31;
Color Plate, Figure 18

Minonoa pachitea Hopp, 1922: 430.—Sick, 1939: 1308.

Diagnosis. Entirely dark fuscous with a diagonal orange band across forewing (Fig. 127).

Adult Male. Unknown.

Adult Female (Fig. 127). Forewing length 10 mm. **Head:** Dark fuscous. **Thorax:** Dark fuscous. Forewings apical and

basal areas dark fuscous with a broad orange band between them, orange projecting into the apical area from the middle of the apical side of the band. Hindwings dark fuscous. Ventral wings as dorsal. Legs whitish. *Abdomen*: Dark fuscous. Genitalia as in Figure 255.

Type. Holotype female [not male as stated in original description], ZSBS.

Type Locality. Peru, Dept. Huánuco, Pachitea.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Unknown.

Distribution (Map 31). Peru, probably in Tropical Moist Forest (maybe Tropical Dry Forest) Life Zone.

Discussion. *Minonoa pachitea* is known only from the holotype, which is missing its left hindwing.

Minonoa perbella Schaus

Figures 128, 257; Map 31;

Color Plate, Figure 17

Minonoa perbella Schaus, 1905: 332.—Dyar, 1910c: 120; 1927: 551.—Dyar and Strand, 1913b: 30.—Sick, 1939: 1308.

Dalcera variegata Jones, 1908: 176. NEW SYN.

Dalcera? variegata:—Dyar and Strand, 1913b: 27.—Sick, 1939: 1304.

Minonoa variegata:—Dyar, 1927: 551.

Diagnosis. Distinguished by complex multicolored pattern on forewing (Fig. 128).

Adult Male. Unknown.

Adult Female (Fig. 128). Forewing length 11 mm. *Head*: Vertex and frons and antennae grey. Labial palpi ochreous. *Thorax*: Dorsum golden yellow, tegulae and patagia fuscous; venter golden yellow. Forewings yellow, outer half suffused with fuscous, very dark at termen; wavy anti-median line; brown spot in cell; orange line bordered by dark fuscous on discocellulars followed distally by yellow space; yellow spaces between veins at margin, especially at apex. Hindwings orange-yellow; inner and outer margins broadly dark fuscous. Ventral wings: forewings yellow, outer half dark fuscous with two yellow spots at apex; hindwings yellow, broadly black on outer

margin. Legs ochreous, tarsi white, claws dark fuscous. *Abdomen*: Dorsum golden yellow; venter pale ochreous. Genitalia as in Figure 257.

Types. Holotype female, USNM 8906 (*perbella*); holotype female, BMNH (*variegata*).

Type Localities. Brazil, Rio de Janeiro, Petrópolis (*perbella*); Brazil, Paraná, Castro, 950 m, E. D. Jones (*variegata*).

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Unknown.

Distribution (Map 31). Southern Brazil, in Subtropical Wet Forest and Warm Temperate Moist Forest Life Zones.

Discussion. Known only from the two types, both of which are missing parts of forewing pattern.

Paracraga Dyar

Paracraga Dyar, 1905a: 176; 1910c: 121.—Dyar and Strand, 1913b: 30.—Hopp, 1921: 277.—Sick, 1939: 1309.—D'Almeida, 1945: 195.—Fletcher and Nye, 1982: 118. Type species: *Paracraga innocens* Schaus, 1905, by original designation.

Diagnosis. White or tan ground color with brown or metallic silver ovate maculation on forewing (Figs. 117–124); forewing R_1 arising separately from R_{2+3} , R_{2+3} fused, and R_{4+5} fused (e.g., Fig. 51); large spine on aedoeagus (Figs. 204, 207–213).

Adult Male. Medium to large, forewing 8–13 mm. Ground color: white with maculation; brown ovate outline on forewing, usually silvered inside. Antennae: apical scale tuft absent. Forewing: accessory cell absent; R_{2+3} and R_{4+5} short-stalked basally; R_{2+3} fused; R_{4+5} fused; retinaculum absent. Hindwing: R_s not fused with $Sc + R_1$ in cell; frenulum absent. Genitalia: tegumen and sociuncus fused complex; socii not distinct, a few setae on dorsal surface of sociuncus; gnathos a thin plate parallel to ventral surface of sociuncus; vinculum long and narrow (except in valvae complex); valvae fused into valvae-vinculum-juxta complex; juxta platelike internally, fused into complex externally; saccus short and fairly narrow, apex blunt; aedoeagus long

but stout, bulbous at interior end, triangular spine (tip facing toward moth's right) at exterior end.

Adult Female. Medium to large, forewing 12–16 mm. Genitalia: sterigma a wide round depression; ostium bursae narrow; ductus bursae long, narrow to medium width; corpus bursae ovate; ductus seminalis arising about middle of ductus bursa; apophyses posteriores rudimentary; “accessory glands” ovate in lateral view, longer dorsoventrally than in most genera.

Discussion. In contrast to most dalcercids, the species of this genus all possess very similar male genitalia. Species concepts in *Paracraga* are based primarily on wing pattern, because variation in male genitalia between species is very subtle.

KEY TO MALE *PARACRAGA*

1. Forewing ovate completely surrounded by brown border (Figs. 120, 121, 123, 124) 4
- Forewing ovate not completely surrounded by brown border (Figs. 117, 119, 122) 2
- 2(1). Forewing ovate silvered (metallic) inside 3
- Forewing ovate not silvered inside (Fig. 117); border of ovate reaching costa (Fig. 117); northern South America *innocens*
- 3(2). Dorsal forewing ground color whitish (Fig. 122); Peru and Brazil *halophora*
- Dorsal forewing ground color light brown (Fig. 119); Guyana *amianta*
- 4(1). Sides of forewing ovate (lines from costa to inner margin) almost parallel (Fig. 121); Peru and Colombia *canalicula*
- Sides of forewing ovate not parallel; ovate oval or pear-shaped (Figs. 120, 123, 124) 5
- 5(4). Forewing ovate silvered (metallic) inside (Fig. 120); Central America *argentea*
- Forewing ovate not silvered inside (Figs. 123, 124) 6
- 6(5). Forewing length 9–11 mm (Fig. 123); northern South America *necoda*
- Forewing length 8 mm (Fig. 124); Guatemala *pulverina*

Paracraga innocens Schaus
Figures 51, 117, 118, 204,
207, 258; Map 32

Paracraga innocens Schaus, 1905: 331.—Dyar, 1910c: 121.—Dyar and Strand, 1913b: 31.—Sick, 1939: 1309.

Paracraga oxydata Hopp, 1921: 277.—Sick, 1939: 1310. NEW SYN.

Diagnosis. Similar to *Paracraga argentea*, but forewing ovate is narrower, not metallic inside, and its brown border reaches costal margin (Fig. 117).

Adult Male (Fig. 117). Forewing length 9–11 mm. **Head:** Vertex and frons and antennae white. Labial palpi white with brown outside. **Thorax:** White. Forewings white suffused with rusty brown; rusty patch along costal margin past end of discal cell; thin wavy brown line across cell, around brown spot at fork of R_{2+3} and R_{4+5} , back down wing to anal angle; brown dots on veins at outer margin, especially on R_{4+5} ; brown dot behind 1A + 2A near base. Hindwings white with brown marginal shading at anal angle. Ventral wings white with brown shading along forewing costa. Legs white; foreleg coxa, femur, and tibia brown on inside; last tarsi of all legs brown tipped. **Abdomen:** White. Genitalia as in Figures 204 and 207.

Adult Female (Fig. 118). Forewing length 12–14 mm. Colored as in male. Genitalia as in Figure 258.

Types. Holotype male, USNM 8904 (*innocens*); holotype male, SMF (*oxydata*).

Type Localities. French Guiana, Maroni River, Saint-Laurent (*innocens*); Brazil, Estado Amazonas, Tefé (*oxydata*).

Host. Unknown.

Immature Stages. Unknown.

Flight Period. October to July.

Distribution (Map 32). Venezuela, Guyana, Surinam, French Guiana, and northern Brazil (Amazon Basin), in Tropical Moist and Tropical Premontane Wet Forest Life Zones.

Material Examined. 37 males and 7 females. BRAZIL: Amazonas: Fonte Boa, VII, X-1906, S. M. Klages (BMNH); Hyutanahan [now Huitanaã], Rio Purus, I–III, V, VI-1922, Klages (CMNH); Rio Tapajós, [no date] (USNM); Santo Antônio de Javari, V-1907, Klages (BMNH); São Paulo de Olivença, [no date], A. H. Fassl (ZSBS); Tefé, 12-XII-1919 (CMNH), [no date] (SMF, holotype of *oxydata*); “Uypiranga,” VII-1931, W. Hopp (ZSBS); Para: Rio Guamá, 27-I-1894 (BMNH); FRENCH GUIANA: Nouveau Chantier, VII, X-[no year] (BMNH, USNM); Piste de la Mon-

tagne des Singes, Km 10, 150 m, 8-I-1985, J. F. Landry (USNM); Saint-Jean, III-V-1904, W. Schaus, [no date] (BMNH, USNM); Saint-Laurent, IX, XI-1904, Schaus (USNM), II-1906, VII, X, XII-1905, III-[no year], (BMNH), [no date] (MNHP); GUYANA: Mackenzie, Demerara River, 21-VI-1927, [W. T. M. Forbes] (CU); SURINAM: Aroewarwa Creek, Maroewym Valley, IV-1905, Klages (BMNH); Berg en Dal, IV-1892, C. W. Ellacombe (BMNH); VENEZUELA: *Aragua*: Rancho Grande, 1,100 m, 26-V-1946, 26-VI-1946 (AMNH).

Discussion. It is possible that the northern Brazilian specimens represent a distinct species (for which the name *Paracraga oxydata* is available, see later), but I have been unable to find consistent characters for their separation. The wings of the unique male holotype of *oxydata* are very worn, and its identity is not certain, but I cannot find any characters to separate it from *innocens*.

I have seen five males from Peru that are probably *P. innocens*; the forewing pattern appears somewhat different than normal *innocens*, but the specimens are all in poor condition: PERU: *Madre de Dios*: Río Tambopata Reserve, 30 air km SW Puerto Maldonado, 290 m, 11-20-XI-1979, J. B. Heppner (4 males in very poor condition, FSCA, USNM); *Puno*: La Union, Río Huacamayo, 2,000 feet [600 m], XI-1904, wet season, G. Ockenden (BMNH).

Paracraga amianta Dyar

Figures 119, 208; Map 33

Paracraga amianta Dyar, 1910a: 137, fig. 42, no. 22; 1910c: 121.—Dyar and Strand, 1913b: 31.—Sick, 1939: 1309.

Diagnosis. Similar to *Paracraga innocens* but larger and forewing brown lines not reaching costa (Fig. 119).

Adult Male (Fig. 119). Forewing length 11.5 mm. **Head:** Buff. **Thorax:** Buff. Forewings light brown; costa at apex and outer margin yellow; ovate silvery, surrounded by thin brown line from just above anal angle, almost to costal margin, around brown shading in cell apex and back down to lower limit of cell; brown dot near 1A + 2A near base; dots on veins on outer margin. Hindwings white with brownish

suffusion. Ventral wings buff, brownish along forewing costal margin. Legs buff with brown. **Abdomen:** Genitalia as in Figure 208.

Adult Female. Unknown.

Type. Holotype male, USNM 12641.

Type Locality. Guyana, Hoorie [now Huri] Creek, Hoorie Gold Mine, February 1908, C. W. Beebe.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. February.

Distribution (Map 33). Guyana, in Tropical Moist Forest Life Zone.

Discussion. *Paracraga amianta* is known only from the holotype.

Paracraga argentea (Schaus)

Figures 120, 209, 260; Map 34

Minacraga argentea Schaus, 1910: 415.

Paracraga argentea:—Dyar and Strand, 1913b: 31.—Dyar, 1925: 45.—Hoffmann, 1933: 295.—Sick, 1939: 1309.—Schröder, 1963: 493—Beutelspacher, 1992: 145.

Paracraga cyclophera Dyar, 1914: 253.—Sick, 1939: 1310. NEW SYN.

Diagnosis. Similiar to *Paracraga innocens*, but the forewing silver area is completely enclosed by brown line and does not reach costal margin (Fig. 120).

Adult Male (Fig. 120). Forewing length 10–12 mm. **Head:** Vertex and frons and antennae white. Labial palpi white with brown. **Thorax:** White. Forewings silvery buff (ranging from white to pale brownish); ovate silvery white, irregular, thinly outlined with brown extending from near middle of costal margin (but not touching margin) to inner margin near anal angle; brown dots on veins at outer margin, especially on R_{4+5} ; brown spot just behind middle of 1A + 2A. Hindwings silvery white. Ventral wings silvery white. Legs white with brown on foreleg inner femur and tibia. **Abdomen:** White. Genitalia as in Figure 209.

Adult Female. Forewing length 12–15 mm. Colored as in male. Genitalia as in Figure 260.

Types. Holotype female, USNM 16951

(*argentea*); lectotype male, and paralectotype male, here designated, USNM 16101 (*cyclophera*).

Type Localities. Costa Rica, Juan Viñas (*argentea*); Panama, Cabima (*cyclophera*).

Hosts. *Terminalia buceras* Wright (Combretaceae) (Dyar, 1925: 45); *Adelia triloba* (Müller Argoviensis) Hemsley (Euphorbiaceae) (Aiello lot 79-8); *Prunus cerasifera* Ehrhart var. *pissardi* Carrière (Rosaceae) (USNM); *Trema micrantha* (Linnaeus) Blume (Ulmaceae) (Aiello lot 83-9, died as pupa, but same species as lot 79-8); *Uncaria tomentosa* (Willdenow) (Rubiaceae) (Aiello lot 84-23).

Immature Stages. Discussed by Dyar (1925: 45-47).

Flight Period. Year-round.

Distribution (Map 34). Mexico, Honduras, Belize, Guatemala, El Salvador, Costa Rica, and Panama, in Tropical Wet, Tropical Moist, Tropical Premontane Wet, Tropical Premontane Moist, Subtropical Wet, and Subtropical Moist Forest Life Zones.

Material Examined. 54 males and 22 females. BELIZE: Cayo, 13-VII-1972, V. O. Becker (VOB); Punta Gorda, VIII-1934, J. J. White (BMNH); Río Grande, IX-1932, White (BMNH); Río Temash, VII-1934, White (BMNH); [San Pedro] Columbia, III-1932 (USNM); COSTA RICA: Fila Esquinas, 35 km S Palmar Norte, 150 m, 7-8-I-1983, D. H. Janzen & W. Hallwachs (USNM); Hacienda La Suerte/Tapezco, 29 km W Tortuguero, 40 m, 13-31-VIII-1979, J. P. Donahue *et al.* (LACM); Juan Viñas, VI-1909, W. Schaus (USNM, holotype of *argentea*); Oroquí, 1,200 m, [no date], A. H. Fassl (BMNH); Rincón de Osa, 20 m, 10-14-XI-1972, Becker (VOB); San José, [no date] (ZSBS), 24-I-1932, F. Nevermann (ZSBS), V, VIII-[no year], H. Schmidt (BMNH); San Pedro de Montes de Oca, reared on *Prunus cerasifera* var. *pissardi*, 25-II-1937, emerged 11-12-III-1937, C. H. Ballou (USNM); Sirena, Corcovado Nat. Park, Osa Peninsula, 5-11-I-1981, 19-27-III-1981, 23-III, 1-V-1984, 10-19-VIII-1980, Janzen & Hallwachs (USNM); "am [=on Mount] Turrialba," [no date], Nevermann (ZSBS); 9.4 km W Bribri, Suretka, 200 m, 9-11-VI-1983, Janzen & Hallwachs (USNM); Turrialba, 600 m, 20-V-1972, 25-VIII-1971, 20-X-1972, Becker (VOB); GUATEMALA: Cayuga, IV & V [no year], Schaus & Barnes (USNM); Cayuga, [no further data] (CMNH); Quiriquá, [no date], Schaus & Barnes (BMNH); HONDURAS: La Cumbre, 700 m, 2-II-

1922, J. Lienhart (BMNH); Signatepeque, 10-16-VIII-1978, J. Chemsak & E. G. Linsley (UCB); MEXICO: Chiapas: "La Florida," [800 m], VIII-1931 (AMNH); Tapachula, Finca Violeta, 3-X-1954, G. Hartig (ZSBS); Tabasco: [no further locality], I-1914, XII-1913, W. Gugelmann (USNM), "ex larva XII-1913," Gugelmann (AMNH), XI-XII-1913 (ZSBS); Teapa, XII-1913, "R. Müller" [probably collected by Gugelmann] (AMNH, USNM); PANAMA: Barro Colorado Island, 17-V-1984 as larvae on *Uncaria tomentosa*, eclosed 5-7-VI-1984, A. Aiello lot 84-23 (USNM); Cabima, 16-31-V-1911, A. Busck (USNM, paralectotype of *cyclophera*); Cabima, 23-V-1911, Busck (USNM, lectotype of *cyclophera*); Fort Kobbe, VII-1958, 18-IX-1958, W. D. Thomas (CMNH); Pipeline Road, 4 miles [6.4 km] NW Gamboa, ex larva collected 10-III-1979 on *Adelia triloba*, emerged 29-31-III-1979, R. Robbins (USNM) (Aiello lot 79-8).

Discussion. I have seen one male (USNM, genitalia 22588) labeled only "Nicaragua, D. Denning," which probably represents a new species. It is patterned as in *Paracraga argentea*, but the dorsal ground color is light brown and the area inside the forewing ovate outline is light brown. The locality data are not only vague, but also probably wrong. The tri-chopterist Donald G. Denning reported (personal communication, 1985) that he never collected in Nicaragua, and I can find no record (including in USNM Registrar files) of any other D. Denning who may have collected the specimen.

I have seen two worn specimens from Maracay, Venezuela, which appear to be *Paracraga argentea* (male XI-1934, female VII-1934, P. Vogl in ZSBS).

Paracraga canalicula Dognin

Figures 121, 210, 259; Map 32

Paracraga canalicula Dognin, 1910: 42.—Dyar, 1910c: 121.—Dyar and Strand, 1913b: 31.—Sick, 1939: 1310.

Diagnosis. Similar to *Paracraga argentea*, differing in having forewing lines straighter and more parallel (Fig. 121).

Adult Male (Fig. 121). Forewing length 10-11 mm. Colored as in *Paracraga argentea*, but lines on forewing are straighter and more parallel, enclosing a narrower space. Genitalia as in Figure 210.

Adult Female. Forewing length 15 mm.

Colored as in male. Genitalia as in Figure 259.

Type. Holotype male, USNM 29809.

Type Locality. Peru, Dept. Puno, Provincia de Carabaya, Río Inambari, La Oroya, [ca. 900 m].

Host. Unknown.

Immature Stages. Unknown.

Flight Period. October to March, and May.

Distribution (Map 32). Colombia and Peru, in Tropical Wet, Tropical Moist, and Tropical Premontane Wet Forest Life Zones.

Material Examined. 28 males and 1 female. COLOMBIA: *Meta*: Villavicencio, 400 m, [no date], A. H. Fassl (ZSBS); PERU: *Loreto*: [Cruzmuynuna], Middle Río Ucayali, 17-II-1927, H. Bassler F6041 (AMNH); *Puno*: La Oroya, Río Inambari, [no further data] (USNM, holotype); La Oroya, 3,000 feet [900 m], V-1905, dry season, G. R. Ockenden (ZSBS), I-1906, III-1905, X-1904, XI-XII-1905, wet season, Ockenden (BMNH); La Union, Río Huacamayo, 2,000 feet [600 m], XI-1904, wet season, Ockenden (BMNH); Santo Domingo, 6,000 feet [1,800 m], XI-1904, Ockenden (BMNH).

Discussion. One male (La Union, Peru, BMNH) has its forewing ovate broken at CuP.

Paracraga halophora Dyar

Figures 122, 211, 263; Map 35;

Color Plate, Figure 13

Paracraga halophora Dyar, 1928: 10.—Sick, 1939: 1310.

Diagnosis. Similar to *Paracraga argentea*, but larger and forewing silver ovate not completely outlined in brown (Fig. 122).

Adult Male (Fig. 122). Forewing length 11–13 mm. *Head:* White. *Thorax:* White. Forewings white with rusty tint; ovate large and silver, surrounded by very narrow brown line running from anal angle around apex of cell (almost to costa) and back to lower margin of cell; brown dots on veins on outer margin, especially on R_{4+5} ; brown dot near $1A + 2A$ near base. Hindwings white. Ventral wings white. Legs white with brown. *Abdomen:* White. Genitalia as in Figure 211.

Adult Female. Forewing length 16 mm. Colored as in male. Genitalia as in Figure 263.

Type. Holotype male, CU 896.

Type Locality. Peru, Dept. Junín, Colonia del Perené, Pueblo Pardo.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. March to June, November, and December.

Distribution (Map 35). Brazil and southern Peru, in Tropical Moist, Tropical Premontane Wet, and Subtropical Wet Forest Life Zones.

Material Examined. 14 males and 1 female. BRAZIL: *Amazonas*: Santo Antônio de Javari, V-1907, S. M. Klages (BMNH); *Goiás*: Leopoldo de Bulhões, 25-XI, 12-XII-1935, R. Spitz (BMNH); 20 km N São João da Aliança, [ca. 1,000 m], 15-IV-1956, F. S. Truxal (LACM); *São Paulo*: Anhangahi [now Anhangabaú], XI-1926, Spitz (BMNH); PERU: *Junín*: Pueblo Pardo, Colonia del Perené, [1920] (CU, holotype); *Puno*: La Oroya, Río Inambari, 3,000 feet [900 m], V-1905, G. R. Ockenden (ZSBS), III-1905, Ockenden (BMNH); La Union, Río Huacamayo, 2,000 feet [600 feet], XI-XII-1904, Ockenden (BMNH); Río Huacamayo, 3,100 feet [900 feet], VI-1904, Ockenden (BMNH); Yahuar Mayo, 1,200 feet [350 m], IV-V-1912 (BMNH).

Discussion. The holotype bears no date but the following is recorded under CU lot 607 sub 104: "Bought of Srta. Salvatierra, Pueblo Pardo, said to have been caught there at light on various dates," by the CU Expedition of 1920.

There is some variation in the length of the saccus relative to the internal juxta and in the shape of the apex of the external juxta complex (rounded to slightly convex in the middle, from ventral view), but this variation does not seem to be concordant (seven male genitalia examined). The Brazil specimens tend to be smaller (forewing under 12 mm) than the Peru specimens (forewing over 12 mm).

Paracraga necoda (Druce)

Figures 123, 212, 264; Map 33;

Color Plate, Figure 8

Dalcera necoda Druce, 1901: 435.

Paracraga necoda.—Dyar and Strand, 1913b: 31.—Sick, 1939: 1310.

Diagnosis. Similar to *Paracraga argentea*, but darker and inner margin of ovate inflected along M stem (Fig. 123).

Adult Male (Fig. 123). Forewing length 9–11 mm. Similar to *Paracraga argentea*, but wing ground color (dorsal and ventral) light brown or tan; forewing ovate with inner line deflected distally along M (bottom of cell). Genitalia as in Figure 212.

Adult Female. Forewing length 16 mm. Similar to male, but larger and almost white. Genitalia as in Figure 264.

Type. Lectotype male, here designated, and 4 male and 1 female paralectotypes, BMNH.

Type Locality. Colombia, Dept. del Magdalena, Don Amo, 2,000 feet [600 m].

Host. Unknown.

Immature Stages. Unknown.

Flight Period. March, June, and July.

Distribution (Map 33). Colombia, Ecuador, and Venezuela, in Tropical Moist and probably Tropical Premontane Wet and Moist Forest Life Zones.

Material Examined. 12 males and 3 females. COLOMBIA: *Magdalena*: Don Amo, 2,000 feet [600 m], VII-[no year], H. H. Smith (BMNH, types); *Minca*, 2,000 feet [600 m], [no date], Smith (BMNH); *Not located*: "W slopes of Colombia 4400 ft [1300 m]," II-1908 (BMNH) [determination questionable]; *ECUADOR*: *Esmeraldas*: Río Cayapas, [no date], G. Flemming & R. Miketta (BMNH); *VENEZUELA*: *Aragua*: El Limon, 450 m, 19–22-VI-1976, F. Fernandez Y. (UCV); *Carabobo*: Las Quiguas, Esteban Valley, XI-1909–III-1910 (BMNH); Río Borburata, 250 m, 17–24-VI-1971, Fernandez & J. Salcedo (USNM); San Esteban, VII-1909, S. M. Klages (BMNH).

Discussion. Minca, Colombia, is transitional between Tropical Dry and Tropical Premontane Wet Forest Life Zones.

Paracraga pulverina Schaus Figures 124, 213; Map 36

Paracraga pulverina Schaus, 1920: 150.—Hopp, 1921: 282.—Sick, 1939: 1310.

Diagnosis. Differs from *Paracraga argentea* in smaller size and brown (not silver) forewing ovate (Fig. 124).

Adult Male (Fig. 124). Forewing length 8 mm. Similar to *Paracraga argentea*, but

without silvering inside brown forewing ovate outline, and smaller. Genitalia as in Figure 213.

Adult Female. Unknown.

Type. Holotype male, USNM 22498.

Type Locality. Guatemala, Cayuga, June, W. Schaus and J. Barnes.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. June.

Distribution (Map 36). Guatemala, probably in Tropical Moist Forest Life Zone.

Discussion. *Paracraga pulverina* is known only from the unique holotype, which is in poor condition. It might be an aberrant individual of *Paracraga argentea*.

Ca Dyar

Ca Dyar, 1914: 252.—Hopp, 1921: 279.—Sick, 1939: 1310.—Fletcher and Nye, 1982: 27. Type species: *Ca anastigma* Dyar, 1914, by original designation.

Diagnosis. Similar to both *Paracraga* and *Minacragides*, differing in much smaller size, coloration (color similar to *Minacragides* but lacking ovate forewing pattern of *Paracraga*) (Fig. 138), venation (forewing with only two radial veins) (Fig. 52), and male genitalia (Fig. 206).

Adult Male. Small, forewing 6 mm. Ground color: pale yellow with brown suffusion and maculations. Antennae: apical scale tuft absent. Forewing: accessory cell absent; only two radial veins, apparently R_{1-3} and R_{4-5} fused; R_{1-3} and R_{4+5} arising separately from cell; retinaculum absent. Hindwing: R_s fused with $Sc + R_1$ in cell; CuA_1 stalked with M_3 ; frenulum absent. Genitalia: tegumen and sociuncus fused into dorsoventrally flattened complex; socii absent; gnathos thin plate parallel to ventral surface of tegumen-sociuncus complex; vinculum long and (except in valvae-juxta complex) narrow; valvae apparently reduced to lateral angular lobes of vinculum-valvae-juxta complex; juxta internally slender tapered rod, externally fused into vinculum-valvae-juxta complex; saccus long and slender, with bulb at

apex; aedoeagus external end slender, retracted into saclike interior portion.

Adult Female. Unknown.

Discussion. My identification of the forewing radial veins is based on comparison to *Minacragides*, assuming further fusion of R_{1+3} . However, comparison to *Minonoa* and *Paracraga* and the scenario of wing evolution in which the *radius anterior* forms R_1 and the *radius posterior* forms R_{2+5} (Kukalova-Peck, 1983; Lawrence *et al.*, 1991: 15–16) would suggest identification as R_1 and R_{2+5} , but the homologies of the existing veins and role of cross-veins is not clear.

Ca anastigma Dyar

Figures 52, 138, 206; Map 37

Ca anastigma Dyar, 1914: 252–253.—Sick, 1939: 1310.—Forbes, 1942: 395.

Diagnosis. Similar to *Minacragides arnaci*, differing in smaller size, venation (forewing with only two radial veins; Fig. 52), and male genitalia (Fig. 206).

Adult Male (Fig. 138). Forewing length 6 mm. *Head:* White. *Thorax:* Dorsum light yellow; venter white. Forewings light yellow; wavy poorly defined olivaceous shade across inner third of wing and in submarginal area; outer margin with concave light yellow areas between veins; small elongate discal spot; two black dots on margin near apex. Hindwings white. Ventral wings white with brown forewing costal margin. Legs white. *Abdomen:* White. Genitalia as in Figure 206.

Adult Female. Unknown.

Type. Lectotype male and 3 paralectotype males, here designated, USNM 16100.

Type Locality. Panama, Río Trinidad.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. February, March, June, and October to December.

Distribution (Map 37). Panama, in Tropical Moist Forest Life Zone.

Material Examined. 10 males. PANAMA: Río Trinidad, III-1912 (lectotype), 15–31-III-1912 (paralectotype), 20–25-III-1912 (paralectotype), 1–10-VI-

1912 (paralectotype), all A. Busck (USNM); Barro Colorado Island, 9-X, 16-XI, 14-XII-[1934], M. Bates (MCZ, USNM), 5–14-II-1936, Wood, Gertsch & Lutz (AMNH).

Minacragides Dyar

Minacragides Dyar, 1910a: 137; 1910c: 120.—Dyar and Strand, 1913b: 30.—Hopp, 1921: 279.—Sick, 1939: 1308.—D'Almeida, 1945: 194.—Fletcher and Nye, 1982: 103. Type species: *Minacragides arnaci* Dyar, 1910, by monotypy.

Diagnosis. Similar to *Ca*, differing in larger size, venation (forewing has three, not two, radial veins) (Fig. 49), and genitalia (Figs. 214–216).

Adult Male. Small, forewing 8–9 mm. Ground color: pale yellow with brown suffusion and maculation. Antennae: apical scale tuft absent. Forewing: accessory cell absent; R_1 and R_{2+3} stalked; R_{2+3} fused; R_{4+5} fused; retinaculum absent. Hindwing: R_s not fused with $Sc + R_1$ in cell; frenulum absent. Genitalia: tegumen and sociuncus fused complex; socii not distinct, but sociuncus lobes hairy; gnathos a thin plate parallel to ventral surface of sociuncus, setose ventrally; vinculum long and narrow; valvae reduced to paired lobes ventral to aedoeagus, not fused, tips more sclerotized and bluntly hooked; juxta rodlike internally, platelike externally; saccus short and fairly narrow; aedoeagus long and medium thickness.

Adult Female. Small, forewing 10 mm. Genitalia: sterigma medium width; ostium bursae medium width; ductus bursae medium width, very long, recurved at about one-third of length, recurved again at two-thirds, then narrowing; corpus bursae elongate ovate; ductus seminalis arising from ductus bursae where it narrows; apophyses posteriores triangular, small; “accessory glands” ovate in lateral view.

Discussion. My identifications of forewing radial veins are based on comparison to *Minacraga* and assume further fusion of R_{2+3} and R_{4+5} .

KEY TO MINACRAGIDES

1. Forewings pale yellow or tan, with light brown maculation; forewings not falcate 2

- Forewings brown; forewings falcate (Fig. 136) species A
 2. Forewings with large ovate area suffused with black scales (Fig. 137) species B
 Forewings lacking well-defined ovate area (Fig. 135) *arnacis*

Minacragides arnacis Dyar
 Figures 49, 135, 214; Map 37;
 Color Plate, Figure 12

Minacragides arnacis Dyar, 1910a: 137, fig. 42, no. 23; 1910c: 120.—Dyar and Strand, 1913b: 30.—Sick, 1939: 1308.

Ca restricta Schaus, 1940: 86. NEW COMB., NEW SYN.

Diagnosis. Similar to *Ca anastigma*, differing in larger size, venation (Fig. 49), genitalia (Fig. 214), and lobes of eighth abdominal tergite (Fig. 214c).

Adult Male (Fig. 135). Forewing length 8–9 mm. **Head:** Vertex and frons white. Antennae yellowish white. Labial palpi yellow. **Thorax:** White. Forewings pale yellow suffused with light brown; outer margin with concave white areas around dark fuscous streaks between veins; discal spot dark brown; tuft of brown-tipped scales below anal angle. Hindwings white, with faint terminal line. Ventral wings white. Legs white with brown. **Abdomen:** White. Eighth tergite with a posterior hooklike lobe protruding over each side of genitalia. As in Figure 214.

Adult Female. Unknown.

Types. Holotype male, USNM 12642 (*arnacis*); holotype male, USNM 34742 (*restricta*).

Type Localities. Guyana, Hoorie [now Huri] Creek, Hoorie Gold Mine (*arnacis*); Guyana, Bartica District, Kartabo [now Kartabu] (*restricta*).

Host. Unknown.

Immature Stages. Unknown.

Flight Period. February to August and November to December.

Distribution (Map 37). Colombia, Venezuela, Guyana, Surinam, and Peru, in Tropical Moist, Tropical Premontane Wet, and Tropical Premontane Moist Forest Life Zones.

Material Examined. 28 males. COLOMBIA: Cun-

dinamarca: Monterredondo, 1,420 m, 26-V–18-VI-1961, P. B. Schneble (ZSBS); GUYANA: Hoorie Gold Mine [specimen's data label bears only a typewritten "24"]. [II-1908], C. W. Beebe (USNM, holotype of *arnacis*); Kartabu, 21-VII-1922 (USNM, holotype of *restricta*); Rockstone, 25-IV–9-V-[1901], W. J. Kaye (BMNH); PERU: *Puno:* La Oroya, Río Inambari, 3,100 feet [900 m], III, XI–XII-1905, wet season, G. R. Ockenden (BMNH); Yahuarmayo, 1,200 feet [350 m], IV-1913 (BMNH); SURINAM: Aroewarwa Creek, Maroewym Valley, IV-1905, S. M. Klages (BMNH); VENEZUELA: *Aragua:* Rancho Grande, 1,100 m, 8–14-VI-1967, R. W. Poole (USNM), 26-VI-1946 (AMNH); *Bolívar:* El Dorado to Santa Elena road, Km 107, 520 m, 16-VIII-1957, F. Fernandez Y. & C. J. Rosales (UCV); *Carabobo:* Río Borburata, 300 m, 19–22-XI-1955, Fernandez & Rosales (UCV).

Minacragides new species A
 Figures 136, 215; Map 37

Diagnosis. Differs from *Minacragides arnacis* in brown coloration and falcate forewings (Fig. 136).

Adult Male (Fig. 136). Forewing length 9 mm. **Head:** Vertex and frons brown. Antennae brown. Labial palpi white. **Thorax:** Dorsum brown, venter white (? , denuded). Forewings brown; falcate. Hindwings brown, pale along costal margin. Ventral wings brown, forewing inner margin and hindwing costal margin white. Legs white with brown tufts on foretibia and all last tarsal segments. **Abdomen:** Dorsum brown, venter white. Genitalia as in Figure 215.

Adult Female. Unknown.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. October.

Distribution (Map 37). Southeastern Brazil, in Subtropical Wet Forest Life Zone.

Material Examined. 1 male. BRAZIL: *Rio de Janeiro:* [Itatiaia, 400 m], 24-X-1935, J. F. Zikan (IOC).

Discussion. I refrain from naming this species because only one specimen is available. The lines on the wings, evident in the photograph, are artifacts of spreading the wings.

Minacragides(?) new species B
 Figures 50, 137, 216, 262; Map 37

Diagnosis. Differs from *Minacragides arnacis* in forewing pattern (Fig. 137) and venation (Fig. 50).

Adult Male (Fig. 137). Forewing length 8.5 mm. **Head:** Tan. **Thorax:** Tan, with a few brown scales. Forewings light brown or tan; large ovate area running from about Sc to CuP suffused with dark fuscous scales; ovate area is centered on a white patch, which runs along the end of the discal cell from M_1 to CuA_1 . Hindwing pale tan. Ventral wings pale tan, costal edge of forewing suffused with brown. Legs tan, with a few brown scales. **Abdomen:** Tan. Genitalia as in Figure 216.

Adult Female. Forewing length 9.5–10 mm. Apparently colored as in male. Genitalia as in Figure 262.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. November.

Distribution (Map 37). Central Brazil, in Tropical Premontane Moist Forest Life Zone.

Material Examined. 1 male and 2 females. BRAZIL: *Distrito Federal:* Planaltina, 1,000 m, 11-XI-1976, 13-XI-1975, 23-XI-1975, V. O. Becker (VOB, USNM).

Discussion. I refrain from naming this species because all the available specimens are badly rubbed. Although this species is very close to *Minacragides* in male genitalia, it may not belong in *Minacragides*, because it differs in venation from the other species in having a forewing accessory cell and anal loop and having the hindwing Rs fused with Sc + R_1 in the discal cell (Fig. 50).

Oroya, new genus

Type Species. *Oroya aurora*, new species, by present designation.

Diagnosis. Entirely orange; forewing with accessory cell absent, R_1 free, R_2 + R_3 stalked (Fig. 47), R_4 + R_5 stalked; male genitalia with long processes on uncus (Fig. 220).

Adult Male. Medium size, forewing 9–10 mm. Ground color: orange without markings. Antennae: apical scale tuft absent. Forewing: accessory cell absent; well-developed pterostigma present between R_1 and costa; R_2 + R_3 stalked; R_4 + R_5 stalked;

retinaculum present. Hindwing: base of Rs fused with Sc + R_1 ; frenulum present. Genitalia: tegumen and sociuncus fused complex with pair of posterior arms from uncus; socii present as oval hairy pads; gnathos reduced to small processes on inner sides of socii, not fused; vinculum slender, short; valvae fused into complex with juxta (and anellus?), maybe represented by squared lateral lobes of complex; juxta fused into complex with valvae; saccus long, slender; aedoeagus long, slender.

Adult Female. Unknown.

Discussion. Known only from males of type species. The generic name is feminine and refers to the type locality of the type species, La Oroya.

Oroya aurora, new species

Figures 47, 150, 220; Map 44;

Color Plate, Figure 11

Diagnosis. Superficially similar to a small *Acraga*, easily distinguished by venation (Fig. 47) and genitalia (especially long posterior processes of uncus; Fig. 220).

Adult Male (Fig. 150). Forewing length 9–10 mm. Entirely orange, dorsal forewings deep orange with no markings. Genitalia as in Figure 220.

Adult Female. Unknown.

Type. Holotype male, BMNH.

Type Locality. Peru, Dept. Puno, Río Inambari, La Oroya, 900 m.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. January, March, May, and October to December.

Distribution (Map 44). Southern Peru and adjacent Bolivia, in Tropical Premontane Wet, Tropical Premontane Moist(?) (Peru), and Subtropical (Lower?) Montane Wet (Bolivia) Forest Life Zones.

Material Examined. 11 males (all paratypes). BOLIVIA: *La Paz:* Yungas de Coroico, 1,900 m, 19-V-1950, W. Forster (ZSBS); PERU: *Cuzco:* Pilcopata, 600 m, 11–14-XII-1979, J. B. Heppner (USNM); *Puno:* La Oroya, Río Inambari, 3,100 feet [900 m], 1-1906, III-1905, X-1904, G. R. Ockenden, wet season (BMNH, including holotype, USNM, VOB); Santo Domingo, 6,000 feet [1,800 m], XI-1904, Ockenden (BMNH).

Discussion. The species name is from the Latin word *aurora* and refers to the orange color of a sunrise. W. Hopp recognized the ZSBS specimen as a new species, but never published his description. The Pilcopata male has a forewing length of 7.5 mm.

Dalcera Herrich-Schäffer

Dalcera Herrich-Schäffer, [1854]: wrapper, pl. 37, fig. 180.—Walker, 1855b: 1106.—Möschler, 1878: 672.—Druce, 1887: 213.—Kirby, 1892: 542.—Dyar, 1898: 231, 1910c: 114.—Pagenstecher, 1909: 439.—Dyar and Strand, 1913b: 27.—Sick, 1939: 1303.—D'Almeida, 1945: 194.—Orfila, 1961: 259.—Fletcher and Nye, 1982: 48. Type species: *Dalcera abrasa* Herrich-Schäffer, [1854], by monotypy.

Diagnosis. Very similar to *Dalcerina*, differing in forewing R_1 arising separately from R_{2+3} (rather than arising together on a short stalk) (Fig. 55), the vinculum processes in the male genitalia (Figs. 218, 219), the more rounded forewing, and less maculation on the male forewing (Figs. 129, 131, 132).

Adult Male. Large, forewing 16–21 mm. Ground color: orange with maculation and overshading. Antennae: apical scale tuft present. Forewing: accessory cell absent; R_1 arising independently from cell; $R_2 + R_3$ stalked; $R_4 + R_5$ stalked; retinaculum present. Hindwing: R_s not fused with $Sc + R_1$ in cell; frenulum present. Genitalia: tegumen and sociuncus fused complex; socii paired rounded hairy lobes; gnathos a single strongly sclerotized, ridged, near triangular plate; vinculum elongate; valvae not identified (see later); juxta fused into vinculum (see later); saccus elongate, broad, narrowing toward apex; aedoeagus long and slender; two pairs of setose processes arising from vinculum complex.

Adult Female. Large, forewing 20–26 mm. Genitalia: sterigma broad, with deep, narrow cleft in middle; ostium bursae medium width; ductus bursae long, medium width for about one-third of length, recurved, then narrow for one-third of length to ductus seminalis, then recurved to corpus bursae; corpus bursae elongate ovate; ductus seminalis arising at second bend in

ductus bursae; apophyses posteriores wide at base, narrowing to apex, medium length; “accessory glands” ovate in lateral view.

Discussion. The two pairs of setose processes arising from the vinculum complex both appear solidly fused with this complex. The more ventral process (long in *abrasa*, short in *canescens*) might be the bifid end of a juxta fused into vinculum, the more dorsal (rudimentary in *abrasa* [just ventral of setose lump in Figure 218], long in *canescens*) may represent valvae.

KEY TO MALE *DALCERA*

1. No dark terminal stripe on hindwing 2
Dark terminal stripe on hindwing 3
- 2(1). No scarlet patch in anal area of forewing (Fig. 129) *abrasa*
Scarlet patch in anal area of forewing *haywardi*
- 3(1). Dark terminal stripe on hindwing narrow and usually faint, less than 2 mm wide (Fig. 129) *abrasa*
Dark terminal stripe on hindwing wider than above 4
- 4(3). Dark terminal stripe 2–4 mm wide, up to one-quarter width of wing (Fig. 131) *canescens*
Dark terminal stripe over 4 mm wide, about half as wide as wing (Fig. 132) *semirufa*

Dalcera abrasa Herrich-Schäffer Figures 7, 18, 19, 21, 55, 129, 130, 218, 261; Map 38

Dalcera abrasa Herrich-Schäffer, [1854]: 7, 59, 79, fig. 180.—Walker, 1855b: 1106.—Möschler, 1878: 673.—Kirby, 1892: 542.—Dyar, 1898: 231; 1910c: 114.—Dyar and Strand, 1913b: 27.—Hopp, 1921: 277, 282.—Koehler, 1924: 25; 1928: 9.—Sick, 1939: 1304, pl. 168a.—Araujo, 1951: 55–57.—Orlando and Ribeiro, 1955: 140–146.—Sarmiento, 1958: 20.—Mariconi, 1963: 334–335.—Silva *et al.*, 1968: 295.—Le Pelley, 1968: 59, 205, 456.—Watson and Whalley, 1975: 188, pl. 48c.

Diagnosis. Most males differ from *Dalcera canescens* and *D. semirufa* in having dark terminal stripe on hindwing absent (Fig. 129); if stripe is present, then less than 2 mm wide.

Adult Male (Fig. 129). Forewing length 15–20 mm. **Head:** Vertex straw yellow, hairs tipped with dark brown forming brown spot in center. Antennae dark brown with touches of white along sides of shaft,

especially near tip; apical seven segments bear brown hair tuft with white tip. Labial palpi dark brown with varying amounts of white, especially on outer surface. *Thorax*: Dorsum pale yellow at front becoming yellow posterad; brown spot at base of wing behind head; venter pale yellow. Forewings light dirty orange with costal margin yellow (pale along margin, interior bright) with dark fuscous at base; most specimens with fuscous shading along outer margin and/or a small oblique discal mark. Hindwings yellow-orange with white fringe, sometimes with outer margin slightly to moderately darkened. Ventral wings colored like dorsal wings, except colors not so bright. Forelegs orange, coxa, outer femora and tibia and all the tarsi dark brown, the distal edge of the tibia and each tarsomere ringed with white; midlegs orange, tibia and tarsomeres as in forelegs; hindlegs orange, fourth and fifth tarsomeres brown tipped. *Abdomen*: Yellow-orange of hindwings. Genitalia as in Figure 218.

Adult Female (Fig. 130). Forewing length 20–26 mm. Colored as in male, usually with less fuscous shading on outer margin of forewing. Genitalia as in Figure 261.

Type. Lost?.

Type Locality. Colombia.

Host. *Coffea arabica* Linnaeus (Rubiaceae) (Araujo, 1951; Orlando and Ribeiro, 1955; Le Pelley, 1968); *Echinochloa polystachia* (Kunth) Hitchcock (Gramineae) (INPA); *Eucalyptus robusta* Smith and *Eucalyptus* sp. (Myrtaceae) (UCV); *Spondias purpurea* Linnaeus (Anacardiaceae) (USNM).

Immature Stages. Described by Araujo (1951).

Flight Period. Year-round.

Distribution (Map 38). Colombia, Venezuela, Guyana, Surinam, French Guiana, Brazil, Peru, and Bolivia. Recorded from Tropical Wet, Tropical Moist, Tropical Dry, Tropical Premontane Wet, Tropical Premontane Moist, Tropical Lower Montane Moist, Subtropical Moist, Subtropical

Lower Montane Moist, Warm Temperate Moist, and Warm Temperate Dry Forest Life Zones.

Material Examined. Over 350 males and 52 females. Abbreviated data: BOLIVIA: *Cochabamba*: Chaparé, 400 m, XII (ZSBS); *El Beni*: Santa Ana, Río Yacuma, 220 m, V (ZSBS); *La Paz*: Río Zongo, 750 m (NHMV, USNM, ZSBS); *Santa Cruz*: "Prov. del Sara" [now Gutiérrez], 450 m, VIII (BMNH, CMNH); Puerto Suarez, 150 m, XII (CMNH); BRAZIL: *Amapá*: Serra do Navio, III (MNRJ); *Amazonas*: Amataurá, Rio Solimões, II (CU); Amazon between Tefé and Tonantins, XI (USNM); Canal Maturaca, Mission Cauaburi, 70 m, XII (ZSBS); Codajás, IV (BMNH); Fonte Boa, IV, VI–X (BMNH); Hyutanahan [now Huitanaã], Rio Purus, I–IV (CMNH); Ilha de Marchantaria, Rio Solimões, larva 7–XII–1983 on *Echinochloa polystachia*, pupated 9–XII, emerged 4–I–1984, J. Adis (INPA); Lower Amazon and Rio Madeira, II–III (BMNH); Manaus, IX (BMNH); Miracema, Rio Purus, IV (CMNH); Nova Olinda, Rio Purus, IV (CMNH); Parana de Buyassu [now Igarapé Buiçu], Lower Amazon, I (BMNH); Rio Madeira (BMNH); Rio Negro, "Kl. 12," VII–VIII (IOC); Rio Tapajós (USNM); Santo Antônio de Javari, VI (BMNH); São Paulo de Olivença, I, XI–XII (BMNH, USNM); Tapurucuará, Rio Negro, XI (ZSBS); Tefé, I, X, XII (BMNH, CMNH); "Uyupiranga," VI (ZSBS), XI (IOC); *Distrito Federal*: Planaltina, 1,000 m, IV, XI, XII (CPAC, VOB); *Goiás*: Veadeiros [now Alto Paraíso], IV (LACM); 20 km N São João da Aliança, IV–V (LACM); *Maranhão*: Maranhão (BMNH); *Mato Grosso*: Chapada dos Guimarães, IV (MNRJ); "Matto Grosso" (ZSBS); Rio Brilhante, I (VOB); *Mato Grosso do Sul*: Corumbá, IV (VOB); Salobra V, XI (IOC); *Minas Gerais*: Serrinha, Diamantina, X–IV (AMNH); Sete Lagoas, 720 m, IV, V (VOB); *Pará*: Capim, II (MNRJ); Capitão Poço, XI (VOB); Marabá, I (VOB); "Pará" [=Belém] (BMNH); Rio Xingu Camp, 52°22'W, 3°39'S, ca. 60 km S Altamira (USNM); Santarém (BMNH); São Félix do Xingu, Moyer [=middle] Xingu, IX (MNHP); Taperinha (NHMV, USNM); *Rondônia*: Calama, Rio Madeira, VIII–X (BMNH); *Santa Catarina*: "St. Catherine's" (USNM); *São Paulo*: Emas, near Piraçununga, III, XII (IOC); Piraçununga, VI (IOC); *Not located*: Canalitae, Rio Magdalena, VII (ZSBS); COLOMBIA: *Cauca*: Popayan (BMNH, female only); *Cundinamarca*: Medina, 500 m (BMNH); *No locality*: (AMNH); FRENCH GUIANA: Maroni (MNHP); Nouveau Chantier, I, II, V, VII, VIII, XI (BMNH, CMNH, ZSBS); Pied Saut, II, XII (CMNH); Saint-Jean, IV, V (BMNH, USNM); Saint-Laurent, II–IV, VII–XII (BMNH, MNHP, USNM); 60 miles [100 km] up Maroni River, VIII (USNM); GUYANA: Bartica, I (BMNH, CMNH); Berbice [now New Amsterdam] (BMNH); Fort Akayma, Rio Demerara (UMO); Kartabu, III, VI, X, XII (AMNH, CMNH, USNM); Kutari Sources, I–II (BMNH); MacKenzie, VI (CU); Moraballi Creek, Essequibo River, XI (BMNH); New

Amsterdam (BMNH); New River, I–III (BMNH); Omai (USNM); Plantain Is., III (USNM); Potaro, I, II, V (BMNH); Potaro River (UMO); Río Demerara (BMNH); Rockstone, VII, IX (AMNH, USNM); Tumatumari, VI, XII (BMNH, CU); Upper Courantyne River, King Frederick William IV Falls, III (BMNH); Wismar, V, VI (AMNH); PERU: *Amazonas*: Chanchamayo (BMNH); *Cuzco*: Buenos Aires, 53 km W Pilcopata, 2,280 m, XII (USNM); Marcapata (ZSBS); Pilcopata, 600 m, XII (FSCA); *Huánuco*: Tingo María, XII (MPM); *Junín*: La Merced, Chanchamayo (USNM); *Loreto*: Contamana, Río Ucayali, X–XII (BMNH); Lower Río Ucayali, II (AMNH); Río Ucayali (BMNH); San Miguel, VIII (AMNH); Río Napo, VI (CMNH); *Madre de Dios*: Río Tambopata Reserve, 290 m, XI (FSCA); *Puno*: La Union, Río Huacamay, 600 m, XII (BMNH); La Oroya, Río Inambari, 900 m, I (BMNH); Río Huacamay, 900 m, VI (BMNH); Santo Domingo, 1,900 m, XII (BMNH); Yahuar mayo, 350 m, II–III (BMNH); *San Martín*: Jepelacio (USNM); Shapaja, Upper Río Huallaga, XI (AMNH); Upper Río Huallaga, XI (CU); SURINAM: Aroewarwa Creek, Maroewym Valley, IV, VII (BMNH); Brokopondo (RNHL); Moengo, Boven, Cottica River, V (CU, USNM); Paramaribo (RNHL); Patamakka River (RNHL); VENEZUELA: *Amazonas*: Mount Marahuaca, N. Slopes, Benitez Camp, V (USNM); San Carlos de Río Negro, VIII, X (UCV); Santa Lucía, Río Negro, II, VIII, XI (UCV, USNM); Cerro de la Neblina basecamp, 0°50'N, 66°9'44"W, 140 m, II–III (USNM); *Aragua*: El Castaño, "en *Eucaliptus* [sic]," VI (UCV); Rancho Grande, 1,100 m, XII (UCV); *Bolívar*: El Bochínche Res. Forestal Imataca, 200 m, XII (UCV); El Dorado to Santa Elena Road, Km 107, 520 m, VIII (UCV); *Carabobo*: Las Quiguas, Esteban Valley (CMNH); San Esteban, VI, XI (BMNH, UCV); Río Borburata, 250 m, I (UCV); *Mérida*: Mérida, IX, no date (BMNH, CMNH, MNHP, NHMV, UMO, USNM, ZMUC, ZSBS); Mérida, 1,630 m (BMNH, CMNH, ZSBS); Mérida, Terre temperee (USNM); Valle, 2,200 m (BMNH); *Monagas*: Uverito, X ("en *Eucaliptus* [sic] *robusta*"), XI (UCV); *Zulia*: San José de Los Altos, Sierra de Perija, 1,150 m, X (UCV); *Not located*: Andes, 1,500–4,000 m (RNHL); "L. Laglaize," XII (USNM); "Venezuela" (BMNH, CMNH, USNM, ZSBS).

Discussion. This is the most common dalcercid in collections and has the widest known distribution. The darkness of the outer margins of both wings and the size of the forewing discal spot are all highly variable. I have seen one Venezuela female (USNM) in which the right side forewing venation is normal (R_1 and R_{2+3} arise separately from cell) but R_1 and R_{2+3} arise together on the cell on the left side.

Herrich-Schäffer (1856: 7) listed his fig-

ure 509 as *Dalcera abrasa* but correctly cited figure 509 elsewhere (l.c. 59, 84) as *Scopelodes palpalis* Walker (now a synonym of *Scopelodes unicolor* Westwood; Limacodidae).

Dalcera haywardi Orfila Map 39

Dalcera haywardi Orfila, 1961: 260–261, fig. 9, pl. I, fig. 7.

Diagnosis. Similar to *Dalcera abrasa*, supposedly differing in having a scarlet spot in the anal area of the dorsal forewing; probably not a valid species.

Adult Male. Wing expanse 34–38 mm (Orfila, 1961). Very similar to *Dalcera abrasa*, but with a scarlet spot in the anal area of the dorsal forewing.

Adult Female. Unknown.

Type. Holotype, male, lost?

Type Locality. Argentina, Salta, Dept. Oran, Río Aguai, Vespucio.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. October.

Distribution (Map 39). Known only from the type locality in northern Argentina, probably in Warm Temperate Moist Forest Life Zone.

Material Examined. None.

Discussion. This species is known to me only by the description. The curators at MBR (where Orfila's collection is now located), MLP, IML, and INTA were unable to locate any specimens. It is distinguished from the closely related *Dalcera abrasa* only by the scarlet spot in the "anal area" of the forewing and is probably a synonym of *D. abrasa*.

Dalcera canescens Tams Figures 131, 219; Map 39; Color Plate, Figure 3

Dalcera canescens Tams, 1926: 35.—Sick, 1939: 1311, pl. 168c.

Dalcera consanguinea Dyar, 1927: 550.—Sick, 1939: 1311. NEW SYN.

Diagnosis. Similar to *Dalcera abrasa*,

differing in darker forewing than the darkest *abrasa*, wider hindwing margin (Fig. 131), and male genitalia (Fig. 219).

Adult Male (Fig. 131). Forewing length 18–21 mm. Similar to *Dalcera abrasa* except in coloration of wings. Forewings dirty orange with a fuscous suffusion, especially heavy toward outer margin; costa (except for brown base) and inner margin white. Hindwing yellow-orange with a narrow outer dark fuscous border, less than one-fourth the length of the wing wide. Genitalia as in Figure 219.

Adult Female. Unknown.

Types. Holotype male, BMNH (*canescens*); lectotype male, USNM 40713, here designated (*consanguinea*).

Type Localities. Peru, Puno, Yahuar-mayo, 1,200 feet [350 m] (*canescens*); Brazil, Amazonas, Rio Tapajós (*consanguinea*).

Host. Unknown.

Immature Stages. Unknown.

Flight Period. April, July, September, and November to January.

Distribution (Map 39). Surinam, French Guiana, Brazil, and Peru, in Tropical Moist and Tropical Premontane Wet Forest Life Zones.

Material Examined. 18 males. BRAZIL: *Amapá*: Serra do Navio, 7-II-1964, O. H. H. Mielke (MNRJ); *Amazonas*: Miracema, Rio Purus, IV-1917, S. M. Klages (CMNH); Rio Tapajós (USNM, lectotype of *consanguinea*); *Pará*: Marabá, 50 m, 9-I-1977, V. O. Becker (VOB); "Pará" [=Belém], [no date], A. M. Moss (BMNH); *Rondônia*: Porto Velho, Rio Madeira (USNM, paralectotype of *consanguinea*); FRENCH GUIANA: Pied Saut, Oyapock River, XII-1917 (CMNH); PERU: *Huánuco*: Tingo María, 24-XII-1949, H. A. Allard (USNM); *Puno*: La Oroya, Rio Inambari, 3,100 feet [900 m], IX-1905, G. R. Ockenden (BMNH); La Union, Rio Huacamayo, 2,000 feet [600 m], XI-1904, wet season, Ockenden (BMNH); Yahuar-mayo, 1,200 feet [350 m], IV-1912 (BMNH, holotype of *canescens*); SURINAM: Aroewarwa Creek, Maroewym Valley, VII-1905, Klages (BMNH).

Discussion. This species has sometimes been collected at the same sites and dates as *Dalcera abrasa*.

Dalcera semirufa Druce
Figure 132; Map 39;
Color Plate, Figure 1

Dalcera semirufa Druce, 1910: 177.—Dyar and Strand, 1913b: 27.—Sick, 1939: 1304.

Diagnosis. Similar to *Dalcera abrasa* and *D. canescens* except forewings are darker and dark fuscous margin of hindwing is very wide (Fig. 132).

Adult Male (Fig. 132). Forewing length 16–17 mm. Similar to *Dalcera abrasa* except in coloration of wings. Forewings deep reddish brown dorsally. Ventral forewings dark fuscous forward of bottom of cell and CuA_2 and along outer margin, area around inner margin orange yellow. Hindwings (dorsum and venter) orange-yellow with very broad dark fuscous border, one-third to one-half the length of the wing wide. Genitalia as in *D. abrasa*.

Adult Female. Unknown.

Types. Lectotype male, here designated, and paralectotype male, BMNH.

Type Locality. Colombia, Dept. del Chocó, Río "Somana," Río San Juan, Novita, 150 feet [45 m].

Host. Unknown.

Immature Stages. Unknown.

Flight Period. Unknown.

Distribution (Map 39). Western slopes of Andes of Colombia, in Tropical Wet and Tropical Rain Forest Life Zones.

Material Examined. 3 males. COLOMBIA: *Cauca*: Río [San Juan de] Micay, [no date], W. Hopp (ZSBS); *Chocó*: Novita, Río "Somana" [Tamaná], Río San Juan, 45 m, [no date], G. M. Palmer (BMNH, types).

Discussion. The male genitalia of *Dalcera semirufa* are almost identical to those of *Dalcera abrasa*. *Dalcera semirufa* may be a small, dark subspecies of *D. abrasa*, but because of the great external differences and the absence of data on females and immatures, I prefer to retain it as a valid species. Only a few specimens of *D. abrasa* are known from Colombia, including a female from Popayan, which I am assuming is *D. abrasa* because it has the

size (forewing 23 mm) and coloration of *D. abrasa*.

Dalcerina Dyar

Dalcerina Dyar, 1898: 232; 1910c: 115.—Dyar and Strand, 1913b: 28.—D'Almeida, 1945: 194.—Fletcher and Nye, 1982: 48. Type species: *Dalcerina tijucana* Schaus, 1892, by original designation.
Zadalcera Dyar, 1910c: 114, 115.—Dyar and Strand, 1913b: 27.—D'Almeida, 1945: 195.—Orfila, 1961: 261.—Fletcher and Nye, 1982: 171. Type species: *Dalmera* [sic] *fumata* Schaus, 1894, by original designation. [synonymized under *Dalcerina* by Hopp, 1921: 277]

Diagnosis. Very similar to *Dalcerina*, differing in forewing R_1 arising together with R_{2+3} on a short stalk from the cell (rather than R_1 and R_{2+3} arising separately) (Fig. 56), vinculum processes in the male genitalia (Fig. 217), more triangular forewing (less rounded, especially at anal angle), and submedial shading and curved inner half-band on the male dorsal forewing (Fig. 133).

Adult Male. Medium to large, forewing 14–20 mm. Ground color: orange with maculation. Antennae: apical scale tuft present. Forewing: accessory cell absent; R_1 arising together with R_{2+3} on a short stalk from cell; $R_2 + R_3$ long-stalked; $R_4 + R_5$ short-stalked; retinaculum present. Hindwing: R_s not fused with $Sc + R_1$ in cell; frenulum present. Genitalia: tegumen and sociuncus fused complex; socii paired hairy lobes; gnathos one strongly sclerotized, ridged, near triangular plate; vinculum elongate; valvae not identified, probably the squarish paired processes dorsal of the aedoeagus in the diaphragma (see below); juxta Y-shaped, with single tapered branch interiorly, externally with paired setose lobes, with small, short lobe between them (it is possible that these paired setose lobes could be valvae); saccus elongate, broad, tapering to apex; aedoeagus long and slender; a semicircular slender, flexible, rod attached at the middle between the outside of the juxta and the inside of the ventral wall of the saccus.

Adult Female. Large, forewing 20–24 mm. Genitalia: sterigma broad, with broad U-shaped cleft in middle; ostium bursae narrow; ductus bursae long, medium width about first $\frac{2}{6}$ then recurved $\frac{1}{6}$ of length to ductus seminalis, then recurved to corpus bursae; corpus bursae ovate; ductus seminalis arising at second bend in ductus bursae; apophyses posteriores narrow, long; “accessory glands” ovate in lateral view.

Discussion. The homology of the semicircular rodlike process already mentioned is unknown, but the structure may be related to the bifid anellus attached to the vinculum of some Epipyropidae (see Heinrich, 1931: fig. 5).

Dalcerina tijucana (Schaus)

Figures 1–3, 56, 133, 134,
217, 267; Map 40; Color Plate, Figure 4

Dalcerina tijucana Schaus, 1892: 322.

Dalcerina tijucana:—Dyar, 1898: 232; 1910c: 115.—Dyar and Strand, 1913b: 28.—Hopp, 1921: 277–279.—Sick, 1939: 1305, pl. 168f.—Schoorl, 1990: 253.—Miller, 1993: 179.—Hogue, 1993: 327.

Dalmera [sic] *fumata* Schaus, 1894: 238.

Dalcerina fumata:—Dyar, 1898: 231.

Zadalcera fumata:—Dyar, 1910c: 115.—Dyar and Strand, 1913b: 27.—Sick, 1939: 1304.—Gomes and Reiniger, 1939: 26.—Lima, 1945: 181–184, figs. 76–81.—Gomes, 1940: 60–61, 72, 89, 106, 107, 246.—Duarte, 1947: 189.—Biezanko *et al.*, 1949: 169; 1966: 5.—Orfila, 1961: 262–263, figs. 4, 10–12, pl. 1, figs. 8, 9.—Biezanko, 1961a: 3; 1961b: 4.—Ruffinelli Rey, 1967: 20.—Silva *et al.*, 1968: 296.—Borror and DeLong, 1969: 339, figs. 26–65.—Gonçalves and Gonçalves, 1973: 13.—Biezanko *et al.*, 1974: 124; 1978: 58.—Guimarães, 1977: 39. [synonymized under *tijucana* by Hopp, 1921: 277]

Zadalcera arhathodota Dyar, 1910c: 115.—Dyar and Strand, 1913b: 27.—Sick, 1939: 1304. NEW SYN.
Zadalcera muncia Dyar, 1923: 30.—Sick, 1939: 1304. NEW SYN.

Zadalcera dierrhyoea Dyar, 1923: 30.—Sick, 1939: 1304. NEW SYN.

Diagnosis. See diagnosis of *Dalcerina*.

Adult Male (Fig. 133). Forewing length 14–20 mm. **Head:** Vertex light orange. Antennae dark brown with touches of white along sides of shaft, especially near tip; apical seven segments bear brown hair tuft with white tip. Labial palpi dirty orange. **Thorax:** Dorsum pale yellow becoming

yellow posterad; venter orange. Forewings pale yellow dorsally, faintly reddish along outer and inner margins, lightest along costal margin; elongate oblique dark fuscous discal mark; below discal mark and from near the base of Sc to middle of outer margin a smokey suffusion, often broadening at outer margin to cover M_1 – M_3 ; below this a crescent-shaped mark extends to inner margin. Dorsal hindwing yellow-orange. Ventral wings yellow-orange, with dark fuscous base of costal margin and discal mark on forewing. *Abdomen*: Yellow-orange. Genitalia as in Figure 217.

Adult Female (Fig. 134). Forewing length 20–24 mm. Colored as in male, except forewing markings reduced to discal spot only or absent. Genitalia as in Figure 267.

Types. Holotype male, USNM 12547 (*tijucana*); lectotype male, USNM 12547, and 4 male paralectotypes, here designated (*fumata*); holotype male, USNM 25424 (*muncia*); holotype female, USNM 13056 (*arhathodota*); holotype female, USNM 25304 (*dierrhyeoa*).

Type Localities. Brazil, Estado do Rio de Janeiro, Rio de Janeiro, Tijuca (*tijucana*); Brazil, Estado do Paraná, Castro (*fumata*); Paraguay, Dept. Cordillera, San Bernardino (*muncia* and *dierrhyeoa*); Brazil, "Rio Janeiro" (*arhathodota*).

Hosts. *Citrus sinensis* (Linnaeus) Osbeck (Rutaceae) (Biezanko *et al.*, 1949: 169); *Eucalyptus saligna* Smith (Myrtaceae) (Silva *et al.*, 1968: 296); *Ouratea* sp. (Ochnaceae) (CPAC 9400, V. O. Becker, personal communication, 1985).

Immature Stages. Described and illustrated by Gomes and Reiniger (1939) and Lima (1945).

Flight Period. Year-round.

Distribution (Map 40). Brazil, eastern Peru, Paraguay and northern Argentina. Recorded from Tropical Wet, Tropical Moist, Tropical Premontane Moist, Subtropical Wet, Subtropical Moist, Subtropical Dry, Subtropical Lower Montane Moist Forest, and Warm Temperate Moist Forest Life Zones.

Material Examined. Over 200 males and 27 females. Abbreviated data: ARGENTINA: *Misiones*: Eldorado, III–VI (ZSBS), XII (BMNH); Loreto, V (ZSBS); Puerto Bemburg, IV (BMNH); BRAZIL: *Bahia*: Itabuna, I (VOB); *Distrito Federal*: Planaltina, 1,000 m, IV–VI, XI–XII (VOB, CPAC); *Goiás*: Leopoldo de Bulhões, XI–XII (BMNH); 20 km N São João da Aliança, IV–V (LACM); 24 km E Formoso, V (LACM); Veadeiros [now Alto Paraíso], IV–V (LACM); *Mato Grosso do Sul*: Campo Grande (ZSBS); *Minas Gerais*: Fazenda dos Campos, 1,500 m (ZSBS), I, II (IOC); "Minas Geraes," XII (BMNH); Passos, XII (IOC); Serrinha, Diamantina (AMNH); Oliveira, XII (VOB); Ouro Preto (BMNH, UMO); Uberaba (ZSBS); *Paraná*: Castro (BMNH, MMU, USNM); Castro, 950 m (BMNH); Foz do Iguaçu, I (VOB); Iguaçu, I, XII (BMNH, UMO); Rolândia, V (ZSBS); *Rio de Janeiro*: Cantagalo (MCZ); Engenheiro Passos, III (IOC); Maricá, I, X (USNM, VOB); Organ Mts. near Tijuca (BMNH); "Rio de Janeiro" (NHMV), IX (ZSBS); *Rio Grande do Sul*: Barracão, XI (CMNH); Elsenau (BMNH); Guarani, XI–XII (CMNH, CU); Pelotas, IV, XII (CMNH, MCZ); *Santa Catarina*: Lajes, XII (LACM); Nova Brémen, Rio Laeiss, II (ZSBS); Nova Teutonia, III (PMY, USNM); "St. Cath.," (BMNH); *São Paulo*: Alto da Serra, II–V, XII (BMNH); Araçatuba, 450 m, IV (BMNH); Campos do Jordão, II (IOC); Campos do Jordão, Umuarama, 1,700 m, I, III (IOC); Campos do Jordão, Lagoinha, 1,500 m, II (IOC); Emas, near Piraçununga, III, XII (IOC); Piraçununga, III, XII (IOC); 3.4 km NNW Padua Sales, Mun. de Mogi Guaçu, IV (AMNH); Ipiranga, IV, XII (BMNH, USNM, ZSBS); Paranapanema (USNM); São Paulo, XI (USNM); São Paulo, 750 m, IV (BMNH); São Paulo, 900 m, I (VOB); PARAGUAY: *Central*: Asunción (AMNH); Patiño Cué (BMNH); *Cordillera*: San Bernardino, XII (USNM); *Guairá*: Villarrica, II, V, VII, XII (BMNH, NHMV, USNM, ZSBS); *Itapúa*: Encarnación (USNM); *Paraguari*: Sapucaí, I, XI, XII (BMNH, USNM); PERU: *Ucayali*: Aguaytía, Huallaga, 400 m, VII (BMNH).

Discussion. This is a widespread and variable species. The smokey suffusion on the forewings, the branching of M_1 from the forewing cell (Hopp, 1921), and the shape of the juxta and vinculum processes in the male genitalia are quite variable (Fig. 217, inset). Despite Hopp's (1921) synonymy of *Zadalcera fumata* under *Dalcerina tijucana*, all references to this species in the agricultural literature have been published as *Z. fumata*.

Females with reduced forewing maculation are very similar to female *Dalcerina abrasa*, although the forewing ground color of *Dalcerina tijucana* is sometimes darker; the forking of forewing R will dis-

tinguish them. The cleft in the sterigma is usually more broad and shallow in *tiju-cana* (Fig. 267) than in *abrasa* (Fig. 261).

I have seen one female labeled "Col./ Coll. J. Arp" (ZSBS), which may mean that the specimen was collected in Colombia, but I do not trust the locality.

Minacraga Dyar

Minacraga Dyar, 1905a: 176; 1910c: 120.—Dyar and Strand, 1913b: 30.—Hopp, 1921: 279.—Sick, 1939: 1309.—D'Almeida, 1945: 194.—Fletcher and Nye, 1982: 103. Type species: *Minacraga disconitens* Schaus, 1905, by original designation.

Diagnosis. Wings usually bronze with metallic maculation (Figs. 139–146); forewing R_1 short-stalked with R_{2+3} , $R_2 + R_3$ stalked, $R_4 + R_5$ stalked (e.g., Fig. 54); male genitalia with tusk- or bladeliike process (Figs. 221–228).

Adult Male. Medium to large, forewing 12–17 mm. Ground color: bronze with maculation. Antennae: apical scale tuft present. Forewing: accessory cell absent; R_1 short-stalked with R_{2+3} ; $R_2 + R_3$ long-stalked; $R_4 + R_5$ long-stalked; retinaculum present. Hindwing: Rs not fused with Sc + R_1 in cell; frenulum present. Genitalia: tegumen and sociuncus forming complex, not fully fused; socii large hairy pads; gnathos median lobe a strongly sclerotized, ridged, near triangular plate, with paired bifid lateral arms, dorsal branch of arms membranous and saclike, ventral (and sometimes anterior) branch more slender and strongly sclerotized [lateral arms absent in *aenea* and *hyalina*]; vinculum elongate; valvae reduced to setose lobes or processes [except in *aenea* and *hyalina*, where developed as narrow-based pointed setose triangular processes fused to vinculum]; juxta strongly developed as independent, long, slender rod, internally almost as long as saccus, externally protrudes about as far as aedoeagus [weakly developed externally in *aenea* and *hyalina*]; saccus medium length, broad; aedoeagus usually long and slender, often slightly curved; tusk- or bladeliike processes arising adjacent to and below valvae.

Adult Female. Large, forewing 19–22 mm. Genitalia: sterigma medium to wide; ostium bursae narrow to wide; ductus bursae long, recurved; corpus bursae ovate; ductus seminalis arising near second bend in ductus bursae; apophyses posteriores rudimentary; "accessory glands" ovate in lateral view.

Discussion. *Minacraga aenea* and *M. hyalina* differ considerably from the other *Minacraga* species in male genitalia, and *M. hyalina* differs in wing shape and pattern as well. They may eventually require a new genus, but I prefer to leave them as *Minacraga*, because they share most characters of other *Minacraga* male and female genitalia and agree in wing venation.

The tusk- or bladeliike processes of the male genitalia are reminiscent of geometrid furca described by Okagaki *et al.* (1956) and are similar in appearance to processes that occur in some Mimallonidae (especially some *Cicinnus* species) and some Limacodidae (such as *Euclea cupostriga* Dyar).

An alternative interpretation of my "valvae" and "tusklike processes" is that my "valvae" are processes of the vinculum and my "tusklike processes" are the true homologues of valvae. A possible analog of the later case occurs in some eumaeine hairstreaks (Lycaenidae), where there are "lateral processes" of the fused vinculum and tegumen, and the slightly reduced valvae surround the aedeagus (see Forbes, 1960: fig. 158).

KEY TO MALE MINACRAGA

1. Dorsal forewing with brown streak at base of inner margin (Figs. 141–146); gnathos with bifid lateral arms; valvae reduced to setose lobes or processes (Figs. 221–226) 2
 - Dorsal forewing without brown streak at base of inner margin (Figs. 139, 140); gnathos lacking lateral arms; obvious valvae present (Figs. 227, 228) 7
- 2(1). Processes of genitalia tusklike, round in cross section; branches of gnathos lateral arms well separated from each other (Figs. 221, 222, 225, 226) 3
 - Processes of genitalia bladeliike, flattened

- laterally in cross section; branches of gnathos lateral arms not well separated from each other, the dorsal branch arising from ventral surface of ventral arm (Figs. 223, 224) 6
- 3(2). Tusklike processes gently curved, with no sharp bends in lateral view (Figs. 221, 222, 225) 4
- Tusklike processes in lateral view sharply bent dorsally at two-thirds of length, then recurved near tips (Fig. 226); southern Brazil *itatiaia*
- 4(3). Tusklike processes long, reaching to or beyond apex of gnathos median lobe (Fig. 221); South America *disconitens*
- Tusklike processes short, not reaching to apex of gnathos median lobe (Figs. 222, 225) 5
- 5(4). The two branches of gnathos lateral arm similar (but not the same) length and thickness (Fig. 225); South America *argentata*
- Dorsal branch of gnathos lateral arm very short and slender [hard to see unless well stained], compared to very long ventral arm (Fig. 222); Venezuela *similis*
- 6(2). Dorsal forewing pattern well marked, as in *disconitens*; processes narrowing toward tip (Fig. 223); Central America *plata*
- Dorsal forewing pattern dull and mottled; processes broadened toward tip (Fig. 224); South America *indiscata*
- 7(1). Forewings rounded; wing ground color bronze, opaque (typical of *Minacraga*) (Fig. 139); southern Brazil *aenea*
- Forewings falcate; wing ground color buff, semitransparent (Fig. 140); northern South America *hyalina*

Minacraga disconitens

Species-Group

See discussion under *Minacraga*, earlier.

Minacraga disconitens Schaus

Figures 13, 17, 54, 141,
142, 221, 268; Map 41;
Color Plate, Figure 5

Minacraga disconitens Schaus, 1905: 331.—Dyar,
1910c: 120.—Dyar and Strand, 1913b: 30.
Minacraga disconitens Dyar [sic]—Sick, 1939: 1309.

Diagnosis. The most common *Minacraga*, differing from other species in long tusklike processes of male genitalia, reaching to or beyond apex of median lobe of gnathos (Fig. 221).

Adult Male (Fig. 141). Forewing length 14–16 mm. **Head:** Vertex and frons pale

buff. Antennae pale buff with occasional brown scales on shaft; apical five segments with brown scale tuft. Labial palpi dark brown, buff at tips. **Thorax:** Dorsum light brown, patagia with dense dark brown elongate scales; venter pale buff. Forewings pale metallic buff, except outer margin, which is dull; broad dark brown streak at base of inner margin; dark fuscous dot at end of cell; subterminal wavy light brown line, followed by metallic buff spots between M_2 and CuA_1 , followed by a dark brown shade along margin; lobe of light brown scales on inner margin. Hindwings pale buff, outer margin shaded with brown, especially around anal angle. Ventral wings pale buff, brownish along outer margins. Legs pale buff, foreleg with brown on anterior side of coxa and inner sides of femur and tarsus. **Abdomen:** Light brown. Genitalia as in Figure 221.

Adult Female (Fig. 142). Forewing length 19–22 mm. Colored as in male, but size larger and wings more broadly rounded. Genitalia as in Figure 268.

Types. Lectotype male, USNM 8905, and 6 paralectotypes (1 in BMNH), here designated.

Type Locality. French Guiana, 100 miles [160 km] up Maroni River.

Hosts. “*Macadamia*” (*Macadamia* species, probably *M. integrifolia* Maiden & Betcher; Proteaceae) (BMNH).

Immature Stages. Unknown.

Flight Period. February to August and October to December.

Distribution (Map 41). Venezuela, Trinidad, Guyana, Surinam, French Guiana, Brazil, eastern Peru, and Bolivia. It has been recorded from Tropical Moist, Tropical Premontane Wet, Tropical Premontane Moist, Subtropical Moist, and Warm Temperate Moist or Dry Forest Life Zones. The Bolivia localities are transitional between Tropical Premontane Dry Forest and Subtropical Moist Forest Life Zones (Becker, 1982: 265, 267).

Material Examined. 77 males and 20 females. BOLIVIA: *Cochabamba*: Chaparé, 400 m, 10-VIII-1951 (ZSBS); *Santa Cruz*: “Prov. del Sara” [now Gutiérrez],

450 m, VIII-1914 (CMNH); Santa Cruz de la Sierra, 450 m, XII-1914 (CMNH); BRAZIL: *Amapá*: Serra do Navio, 16-II-1964 (MNRJ); *Amazonas*: Manaus, III-1945 (AMNH); Amazon between Tefé and Tonantins, XI-1921 (USNM); *Distrito Federal*: Planaltina, 1,000 m, 10-IV-1979, 2-IV-1980 (CPAC); *Mato Grosso do Sul*: Corumbá, 19-25-IV-1985 (VOB); *Minas Gerais*: Sete Lagoas, 15-IV-1979 (VOB); *Pará*: "Pará" [=Belém], [no date] (BMNH); FRENCH GUIANA: Nouveau Chantier, [no date] (USNM), IV-V- [no year] (BMNH); Pied Saut, Oyapock River, XII-1917 (CMNH); Saint-Jean, III, VII-VIII-1904, [no date] (BMNH, USNM, includes paralectotypes); Saint-Laurent, I, II, IV, V, VII, X-XII-[various years], [no date] (BMNH, MNHP, USNM); 60 miles [100 km] up Maroni River, VIII-1904 (USNM, paralectotype); 100 miles [160 km] up Maroni River, IV-1904 (USNM, lectotype and paralectotypes); GUYANA: Kartabu, 8-III-1922 (AMNH); Takutu Mountains, 6°15'N, 59°5'W, 14-XII-1983 (USNM); Upper Kutari River, 15-XII-1935 (BMNH); PERU: *Loreto*: Cavallo-Cocho [Caballococha], IV-VII-1884 (ZSBS); SURINAM: Aroewarwa Creek, Maroewym Valley, IV-1905 (BMNH); TRINIDAD: Arima Valley, 11-IV-1951 (AMNH); Caparo, XII-1905 (BMNH); Morne Bleu, Textel Installation, 4-II-1979 (MJWC); VENEZUELA: *Aragua*: Rancho Grande, 1,100 m, 4-VI-1974, 16-VI-1976, 17-VI-1952, 21-XI-1975 (UCV), 8-14-VI-1967 (USNM), 28-VI-18-VII-1974 (BMNH); *Carabobo*: Las Quiguas, Esteban Valley, XI-1909-III-1910 (BMNH); *Miranda*: Los Teques, 1,600 m, II-1951 (ZSBS); Nucleo El Laurel, 1,200-1,300 m, ex larva on *Macadamia*, 25-V-1971 (BMNH).

Discussion. Schaus described this species from an unstated number of specimens from "Maroni River." The USNM has six males from the Schaus collection, all collected in 1904: three from 100 miles up Maroni River, one from 60 miles up Maroni River, and two from "St. Jean, Maroni"; I consider them all part of the type series. Another Saint-Jean male in BMNH was labeled "cotype" by Schaus. There is also a female from "St. Laurent, Maroni," from the Schaus collection (USNM), but because it does not fit within the wing expanse given by Schaus, it is not considered a type.

I have seen one male that is probably *M. discontiens*, but it differs genitally in having short tusklike processes and smoother valval lobes: VENEZUELA: *Tachira*: Río Frio, 600 m, 2-10-IX-1981, F. Fernandez Y. *et al.* (USNM, genitalia 85-51). I have seen two additional females,

without associated males, which are probably *discontiens*: BOLIVIA: *Not located*: "Nuflo de Chavez, Esperanza, E. Bolivia," 1926-1929 (BMNH); BRAZIL: *São Paulo*: Araçatuba, 450 m, 3-IV-1913 (BMNH).

Minacraga plata, new species

Figure 223; Map 42

Diagnosis. Differs from other *Minacraga* in narrow bladelike processes of male genitalia (Fig. 223).

Adult Male. Forewing length 15-17 mm. **Head:** Vertex and frons pale buff. Antennae pale buff with dark fuscous scale tuft at tip. Labial palpi brown, very dark on outside sides. **Thorax:** Dorsum light brown; venter buff. Forewings pale buff, light brown on outer margin, with light subterminal line through this brown shading; outer margin edged with pale buff with dark brown spots in fringe; discal spot dark brown; some dark brown scales in inner margin. Hindwings pale buff, outer margin shaded with brown, especially around anal angle. Ventral wings pale buff with brown shading around anal angle. Legs buff with brown on foreleg anterior coxa, inner femur and tarsus. **Abdomen:** Pale buff. Genitalia as in Figure 223.

Adult Female. Unknown.

Type. Holotype male, USNM 103449.

Type Locality. Costa Rica, Turrialba, 600 m.

Host. *Alibertia edulis* L. Richard (A. Richard) (Rubiaceae) (Aiello lot 80-48).

Immature Stages. Undescribed.

Flight Period. January, July, and October.

Distribution (Map 42). Costa Rica and Panama, in Tropical Moist, Tropical Premontane Wet, and Tropical Premontane Moist Forest Life Zones.

Material Examined. 4 males. COSTA RICA: Turrialba, 600 m, VII-1981, V. O. Becker (USNM, holotype), 10-I-1973, Becker (VOB, paratype); PANAMA: Canal Zone, Fort Kobbe, VII-1958, W. D. Thomas (CMNH, not designated paratype due to denuded wings); Barro Colorado Island, Snyder/Molino Trail, 7-V-1980 as larva, pupated 25-VII-1980, eclosed 22-VIII-1980, A. Aiello lot 80-48 (USNM, paratype).

Discussion. *Minacraga plata* is similar to *Minacraga disconitens*, but neither the dark brown nor metallic silver on the forewing is as intense. The reared specimen is smaller than the others and is not included in the measurements given. The species name is a noun in apposition from the Spanish word for "silver," honoring the late Robert Silberglied's contributions to knowledge of the Lepidoptera of Panama as well as the silvering of the moths' forewings.

Minacraga similis, new species

Figure 222; Map 42

Diagnosis. Differs from other *Minacraga* in short, curved tusklike processes and configuration of lateral arms of gnathos (Fig. 222).

Adult Male. Forewing length 14 mm. Colored as in *Minacraga disconitens*. Holotype appears to have less brown maculation than *M. disconitens*, but this is due to wear, especially of wing fringe. Genitalia as in Figure 222.

Adult Female. Unknown.

Type. Holotype male, USNM 103450.

Type Locality. Venezuela, Amazonas, Cerro de la Neblina Basecamp.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. February.

Distribution (Map 42). Southern Venezuela, in Tropical Wet Forest Life Zone (probably occurs in adjacent northern Brazil).

Material Examined. Known only from holotype. VENEZUELA: Amazonas: Cerro de la Neblina Basecamp, 0°50'N, 66°9'44"W, 140 m, 4-12-II-1984, D. R. Davis & T. McCabe (USNM, genitalia 28015).

Discussion. Male genitalia differ from those of *Minacraga disconitens* in median lobe of gnathos being thicker and more heavily sclerotized; lateral arms of gnathos having dorsal branch very reduced in length and width and ventral branch longer and more slender; and tusklike processes being shorter and more strongly curved inward apically.

Minacraga indiscata Dyar

Figures 143, 224; Map 43

Minacraga indiscata Dyar, 1910c: 120.—Dyar and Strand, 1913b: 30.—Sick, 1939: 1309, pl. 168e.

Diagnosis. Differs from other *Minacraga* in broad bladelike processes of male genitalia (Fig. 224) and dull forewing pattern (Fig. 143).

Adult Male (Fig. 143). Forewing length 15 mm. *Head:* Vertex and frons buff. Antennae buff with dark fuscous scale tuft at tip. Labial palpi brown, dark on outer sides. *Thorax:* Dorsum light brown; venter buff. Forewings dull light brown, darker toward outer margin and anal angle; occasional dark brown scales; subterminal line light, especially when passing through darker areas; discal spot small, brown. Hindwings pale brown, darker toward anal angle. Ventral wings light brown. Legs buff. *Abdomen:* Light brown. Genitalia as in Figure 224.

Adult Female. Unknown.

Types. Lectotype male, USNM 13060, and paralectotype male, here designated.

Type Locality. French Guiana, Maroni River, Saint-Jean.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. July, November, and December.

Distribution (Map 43). French Guiana, northwestern Brazil, and Peru, in Tropical Moist Forest Life Zone.

Material Examined. 6 males. BRAZIL: Pará: "Pará" [=Belém], "CIV," [no date], A. M. Moss (BMNH); FRENCH GUIANA: Nouveau Chantier, XII-[no year], Dognin Collection from LeMoult (USNM, paralectotype); Saint-Jean, VII-1904, W. Schaus (USNM, lectotype); PERU: Madre de Dios: Río Tambopata Reserve, 30 air km SW Puerto Maldonado, 290 m, 26-30-XI-1979, J. B. Heppner (FSCA, USNM).

Discussion. *Minacraga indiscata* is colored as in *Minacraga disconitens*, but the forewings are more uniform dull brown, apparently lacking the silver scaling on the disk and the brown patch at base of inner margin. However, the wings of the known specimens of *M. indiscata* are rather

rubbed, so these differences must be confirmed on fresh specimens.

Minacraga argentata Hopp
Figures 144, 225; Map 43

Minacraga argentata Hopp, 1922: 429.—Sick, 1939: 1309.

Diagnosis. Differs from other *Minacraga* in configuration of forewing submarginal line (Fig. 144) and short round tusklike processes of male genitalia (Fig. 225).

Adult Male (Fig. 144). Forewing length 13–14 mm. **Head:** Vertex and frons buff. Antennae buff with apical brown scale tuft. Labial palpi buff with brown outside. **Thorax:** Dorsum buff with brown; venter buff. Forewings buff with thin brown submarginal line produced distally between M_2 and CuA_2 , brown suffusion between submarginal line and outer margin; outer margin darkened between M_2 and CuA_2 ; small discal spot; brown streak at base of inner margin, scattered brown scales elsewhere. Hindwings buff, with brownish shading around anal angle. Ventral wings buff. Legs buff. **Abdomen:** Buff. Genitalia as in Figure 225.

Adult Female. Unknown.

Type. Holotype male, ZSBS.

Type Locality. Peru, Dept. Huánuco, Pachitea.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. January, April, May, September, and October.

Distribution (Map 43). Colombia, eastern Brazil, and Peru, in Tropical Wet, Moist, and Premontane Wet Forest Life Zones.

Material Examined. 9 males. BRAZIL: Amazonas: Fonte Boa, V, IX-1906, S. M. Klages (BMNH); COLOMBIA: Guainía: Ob. [=Upper] Río Negro, 800 m, [no date], A. H. Fassl (BMNH); PERU: Huánuco: Pachitea, [no date] (ZSBS, holotype); Tingo Maria, 672 m, 25–31-I-1980, J. B. Heppner (USNM); Loreto: [mouth of Río Samiria], Lower Río Marañón, 23-X-1928, H. Bassler F6132 (AMNH); Puno: Yahuar-mayo, 1,200 feet [365 m], IV-1912 (CMNH, USNM).

Discussion. The single male from Río Negro, Colombia, is larger (forewing 18

mm) and has a longer aedoeagus and sacculus (genitalia 85–47). It apparently belongs here, although its wing pattern is rubbed.

I have seen one male from Brazil (Pará: Taperinha, 1–10-VII-1927, Zerny, NHMV), which is similar to *Minacraga argentata* but differs in male genitalia in having the external portion of juxta longer and thicker, without a lobe at apex, and the tusklike processes shorter, more sinuate, thicker, and more flattened dorsoventrally. The wings are small (forewing 10 mm) and very worn, so the pattern is uncertain.

Minacraga itatiaia, new species
Figures 145, 146, 226, 265;
Map 44

Diagnosis. Coloration similar to *Minacraga aenea*, but lighter and forewings broader (Fig. 145); similar to *M. argentata* but submarginal line less distinct (wings rubbed in all specimens) and genitalia differ, especially in medium length sinuous tusklike processes, long narrow aedoeagus, and configuration of branches of lateral arms of gnathos (Fig. 226).

Adult Male (Fig. 145). Forewing length 14–15 mm. **Head:** Buff, tips of antennae and outsides of labial palpi brown. **Thorax:** Dorsum buff with brown, venter buff. Forewings buff with submarginal shading as in *Minacraga aenea* (rubbed in available specimens). Hindwings buff with brown shading around anal angle. Ventral wings buff. Legs buff. **Abdomen:** Buff. Genitalia as in Figure 226.

Adult Female (Fig. 146). Forewing length 19 mm. Colored as in male. Genitalia as in Figure 265.

Type. Holotype male, BMNH.

Type Locality. Brazil, Rio de Janeiro, Pico do Itatiaia.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. March and April.

Distribution (Map 44). Southern Brazil, in Subtropical Wet, Subtropical Lower Montane Moist, and Warm Temperate Moist Forest Life Zones.

Material Examined. 5 males and 1 female. BRAZIL: *Minas Gerais*: [Ouro] Preto, [no date] (UMO, paratype); *Paraná*: Castro, 950 m, [no date], E. D. Jones (BMNH, USNM, paratypes); *Rio de Janeiro*: Pico do Itatiaia, 28-III-1-IV-1958, H. B. D. Kettlewell (BMNH, holotype); *Santa Catarina*: "St. Catherina," [no date] (BMNH, paratype male and female).

Discussion. The association of the female specimen is questionable and is based on coloration and assumes that the match of the sexes of *Minacranga aenea* is correct. In some male specimens, the external juxta bears a short bifid process (Fig. 226, inset). The species name is a noun in apposition honoring the type locality, a mountain and surrounding national park.

Minacranga aenea Species-Group

See discussion under *Minacranga*, earlier.

Minacranga aenea Hopp

Figures 139, 227, 266; Map 44

Minacranga aenea Hopp, 1921: 279; 1922: 429.—Sick, 1939: 1309.

Diagnosis. Distinguished from all *Minacranga* except *M. hyalina* by obvious, although rudimentary, valvae and lack of gnathos lateral arms (Fig. 227); distinguished from *M. hyalina* by rounded forewing shape and bronze ground color (Fig. 139).

Adult Male (Fig. 139). Forewing length 14–16 mm. *Head*: Vertex and frons buff. Antennae buff with apical brown scale tuft. Labial palpi buff with brown outside. *Thorax*: Dorsum buff; venter buff. Forewings buff, darker toward outer margin; brown subterminal line, outside of which are lustrous white spots in cells between veins M_1 and $1A + 2A$; brown shading in middle of outer margin; discal spot small, brown. Hindwings buff, darker toward anal angle, with brown at anal angle. Ventral wings buff with brown hindwing anal angle. Legs buff with brown. *Abdomen*: Buff. Genitalia as in Figure 227.

Adult Female. Forewing length 21 mm. Colored as in male. Genitalia as in Figure 266.

Type. Holotype male (not female as stated in original description), ZSBS.

Type Locality. Brazil, Santa Catarina, "Joinville?"

Host. Unknown.

Immature Stages. Unknown.

Flight Period. April.

Distribution (Map 44). Southeast Brazil, in Subtropical Wet and Moist Forest Life Zones.

Material Examined. 5 males and 2 females. BRAZIL: *Santa Catarina*: Blumenau, 1-IV-1955 (MCZ); Joinville, [no date], J. Arp (ZSBS, 1 female), [no date] (USNM); "Joinville?", [no date], E. & A. Boettcher (ZSBS, holotype); "St. Catherina," [no date] (BMNH, 1 female); *São Paulo*: Alto da Serra, Santos, 800 m, 7–10-III-1913, E. D. Jones (BMNH).

Discussion. This species and *Minacranga hyalina* differ from other *Minacranga* in having valvae less reduced and lacking lateral arms of gnathos and may eventually require a new genus. The association of the female is questionable; the genitalia of the only specimens available are damaged by fungus.

Minacranga hyalina, new species

Figures 140, 228; Map 42;

Color Plate, Figure 6

Diagnosis. Differs from all *Minacranga* in falcate forewings, forewing subterminal line, and semitransparent wing coloration (Fig. 140).

Adult Male (Fig. 140). Forewing length 12–15 mm. *Head*: Vertex and frons buff. Antennae buff with apical dark fuscous scale tuft. Labial palpi buff with brown outsides. *Thorax*: Dorsum buff; venter buff. Forewings buff, darker along costal margin, falcate; subterminal line with brown inside, white outside; line inflexed between veins CuA_2 and CuP ; discal spot and apex brown. Hindwings buff. Ventral wings buff. Legs buff. *Abdomen*: Buff. Genitalia as in Figure 228.

Adult Female. Unknown.

Type. Holotype male, BMNH.

Type Locality. Peru, Puno, Yahuar-mayo, 365 m.

Host. Unknown.

Immature Stages. Unknown.

Flight Period. March and May.

Distribution (Map 42). Surinam, French

Guiana, Peru, and northern Brazil (Amazon Basin), in Tropical Moist Forest Life Zone.

Material Examined. 5 males. BRAZIL: Amazonas: Hyutanahan [now Huitanaã], Rio Purus, III-1922, S. M. Klages (CMNH, paratype); FRENCH GUIANA: Saint-Laurent, [no date] (ZSBS, paratype); PERU: Puno: Yahuar Mayo, 1,200 feet [365 m], "May-June 1912" (BMNH, holotype; USNM, paratype); SURINAM: Aroewarwa Creek, Maroewym Valley, V-1905, Klages (BMNH, paratype).

Discussion. *Minacraga hyalina* is very close in male genitalia to *Minacraga aenea* but differs externally in more produced apex and coloration of forewing, especially the subterminal line. As already discussed, these two species may eventually require separation from *Minacraga* into a new genus. The species name refers to the hyaline wings, which distinguish this species from other *Minacraga*.

CHECKLIST

Family Dalceridae

Subfamily Acraginae

Acraga Walker, 1855

Pinconia Moore, 1882

Epipinconia Dyar, 1898

Anacraga Dyar, 1905, NEW SYN.

Dalargentina Orfila, 1961, NEW SYN.

Acraga goes Species-Group

goes Schaus, 1910, RESURRECTED COMB.

ingenescens (Dyar, 1927), NEW COMB.

luteola (Hopp, 1921), NEW COMB., UNIDENTIFIED

new species F

Acraga hamata Species-Group

hamata Schaus, 1910

andina, new species

Acraga flava Species-Group

flava (Walker, 1855)

sulphurea (Burmeister, 1878)

obscura (Schaus, 1896)

Acraga infusa Species-Group

ria (Dyar, 1910), NEW COMB.

neblina, new species

serrata, new species

infusa Schaus, 1905

philetera (Schaus, 1910), STATUS UNCERTAIN

conda Dyar, 1910, STATUS UNCERTAIN

Acraga ciliata Species-Group

ciliata Walker, 1855

moorei Dyar, 1898

ochracea (Moore, 1882, not Walker, 1855)

coa (Schaus, 1892)

moribunda Schaus, 1920, NEW SYN.

canaquitam Dyar, 1925

chicana, new species

Acraga concolor Species-Group

concolor (Walker, 1865), NEW COMB.

citrinopsis (Dyar, 1927)

species C

beebei, new species

Acraga melinda Species-Group

melinda (Druce, 1898)

amazonica, new species

meridensis Dognin, 1907

mariala Dognin, 1923

perbrunnea Dyar, 1927

Acraga citrina Species-Group

citrina (Schaus, 1896), RESURRECTED COMB.

albescens (Hopp, 1928), NEW SYN., NEW COMB.

hoppiana, new species

Acraga ferruginea Species-Group

ferruginea Hopp, 1922

brunnea, new species

Acraga ampela Species-Group

ampela (Druce, 1890), NEW COMB.

cosmia Dognin, 1911, NEW SYN.

puno, new species

boliviana Hopp, 1921, NEW STATUS

angulifera Schaus, 1905

isothea Dognin, 1914

leberna (Druce, 1890)

arcifera Dyar, 1910, NEW SYN.

umbrifera (Schaus, 1905)

Acraga ochracea Species-Group

ochracea (Walker, 1855)

victoria, new species

sexquicentenaria (Orfila, 1961), NEW COMB.

parana, new species

Dalcerides Neumoegen and Dyar, 1893

Acragopsis Dyar, 1905, NEW SYN.

Dalcerides flavetta Species-Group

flavetta (Schaus, 1905), NEW COMB.

rebella (Schaus, 1911), NEW COMB.

chirma (Schaus, 1920), NEW COMB.

new species

radians (Hopp, 1921), NEW COMB.

dulciola (Dyar, 1914), NEW COMB.

mesoa (Druce, 1887), RESURRECTED COMB.

gugelmanni (Dyar, 1916), NEW COMB., NEW SYN.

nana (Dognin, 1920), NEW COMB.

sofia (Dyar, 1910), NEW COMB.

sororcula (Dyar, 1927), NEW COMB., NEW SYN.

phasma (Dyar, 1927), NEW COMB., NEW SYN.

Dalcerides ingenta Species-Group

ingenta (Hy. Edwards, 1882)

bicolor Schaus, 1910

alba (Druce, 1887), NEW COMB.

caretta (Dyar, 1910), NEW COMB., NEW SYN.

Zikanyrops Hopp, 1928

dubiosa Hopp, 1928
sparsa Hopp, 1928, UNIDENTIFIED

Subfamily Dalcerinae

- Minonoa* Dyar, 1905
elvira (Dognin, 1909)
pachitea Hopp, 1922
perbella Schaus, 1905
variegata (Jones, 1908), NEW SYN.
Paracraga Dyar, 1905
innocens Schaus, 1905
oxydata Hopp, 1921, NEW SYN.
amianta Dyar, 1910
argentea (Schaus, 1910)
cyclophera Dyar, 1914, NEW SYN.
canalicula Dognin, 1910
halophora Dyar, 1928
necoda (Druce, 1901)
pulverina Schaus, 1920
Ca Dyar, 1914
anastigma Dyar, 1914
Minacragides Dyar, 1910
arnacis Dyar, 1910
restricta (Schaus, 1940), NEW COMB., NEW SYN.
 new species A
 new species B, PLACEMENT UNCERTAIN
Oroya, new genus
aurora, new species
Dalcera Herrich-Schäffer, [1854]
abrassa Herrich-Schäffer, [1854]
haywardi Orfila, 1961, UNIDENTIFIED
canescens Tams, 1926
consanguinea Dyar, 1927, NEW SYN.
semirufa Druce, 1910
Dalcerina Dyar, 1898
Zadalcera Dyar, 1910
tijucana (Schaus, 1892)
fumata (Schaus, 1894)
arhathodota (Dyar, 1910), NEW SYN.
nuncia (Dyar, 1923), NEW SYN.
dierrhyeoa (Dyar, 1923), NEW SYN.
Minacraga Dyar, 1905
Minacraga disconitens Species-Group
disconitens Schaus, 1905
plata, new species
similis, new species
indiscata Dyar, 1910
argentata Hopp, 1922
itatiaia, new species
Minacraga aenea Species-Group
aenea Hopp, 1921
hyalina, new species

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APPENDIX: SYNOPSIS OF ZYGAENOIDEA

This synopsis supplements the characterizations of Common (1970: 828–833), Munroe (1982: 631–633), and Holloway *et al.* (1987), concentrating on pertinent literature and outlining major systematic problems.

Chrysopolomidae. Medium to large, with broad, rounded wings and a bombycid appearance. Ten genera and 25 species, restricted to Africa and Madagascar. Revised by Hering (1937, 1961).

Cyclotornidae. Small, with elongate wings. One genus, *Cyclotorna* Meyrick, with five described species, all Australian. Young larvae are external parasites of Homoptera, later becoming social parasites in ant nests. Discussed by Common (1970: 830) but needs revision.

Dalceridae. Small to medium, with heavy hairy bodies and broadly rounded wings. Eleven genera and 84 species, restricted to the Neotropical Region, except one species that occurs as far north as Arizona.

Epipyropidae. Small to medium, broad-winged moths, similar in appearance to Psychidae. Thirteen genera with 33 species in the Americas, Africa, Australia, and Asia. Reviewed by Krampl and Dlabola (1983), currently being revised by D. R. Davis (USNM). Larvae are ectoparasitic on Homoptera. The “retinaculum” described in *Epimesophantia* Krampl and Dlabola (1983: 452) is not a retinaculum but the wing-locking mechanism (e.g., Common, 1969).

Heterogynidae. Small, the males broad-winged and females wingless. Five species (depending on author) of *Heterogynis* Rambur in southern Europe and the Mediterranean region (Seitz, 1912; Strand, 1923; Zilli and Racheli, 1989). The African genus *Janseola* Hopp includes two species (Gaede, 1926; Hopp, 1923). The anomalous biology and anatomy of *Heterogynis penella* (Hübner) is treated by Chapman (1898) and Daniel and Dierl (1966). *Heterogynidae* Nagy, 1969 (Insecta: Hymenoptera) is a junior homonym; the International Commission on Zoological Nomenclature resolved this problem by emending its spelling to Heterogynidae under the plenary powers (Day, 1985; IZCN, 1987).

Limacodidae (= *Cochlidiidae*, *Heterogeneidae*, *Apodidae*, *Eucleidae*). Small to medium-sized moths. Over 200 genera with over 800 species, worldwide, especially in continental tropical regions; very few on oceanic islands and in Holarctic Region. The only modern treatments are for South Africa (Janse, 1964), Madagascar (Viette, 1980), and Borneo (Holloway, 1986). Most species, as well as genera, still need revision. Hering (1954, 1955) separated the subfamily Crothaeinae within Limacodidae, based on hindwing venation, but Janse (1964) did not recognize the subfamily. Larvae are slug-shaped, some with stinging hairs, and can be important as defoliators of trees.

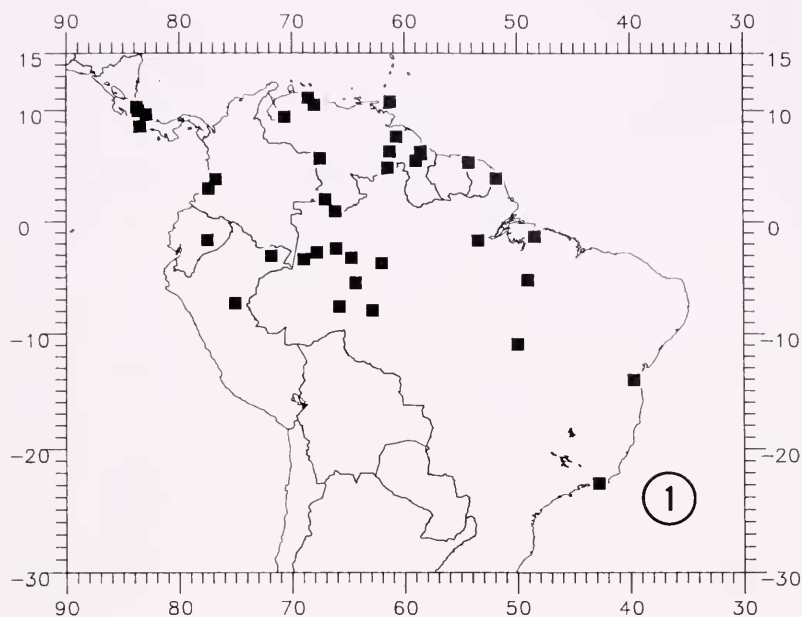
Megalopygidae. Small to large moths. Twenty-three genera with 230 species, mostly neotropical, 11 nearctic. Currently

divided into three subfamilies: Aidinae, Megalopyginae, and Trosiinae. The Trosiinae were revised by Hopp (1927), the whole family was reviewed by Hopp (1935), and Clench (1956) revised Hopp's concept of *Trosia* Hübner, but all species and genera need revision. A unique combination of character states makes the relationships of Aidinae (comprised of *Aidos* Hübner [*Xenarchus* Herrich-Schäffer is a synonym] and *Brachycodilla* Dyar) unclear (Dyar, 1895b: figs. 21, 22; 1910d: 161; Hopp, 1935: 1098; Forbes, 1942: 396; Holloway, 1986: 52; M. E. Epstein, personal communication, 1986). Relationship of Megalopygidae to Somabrachyidae is uncertain. Larvae possess stinging hairs and can be agricultural pests.

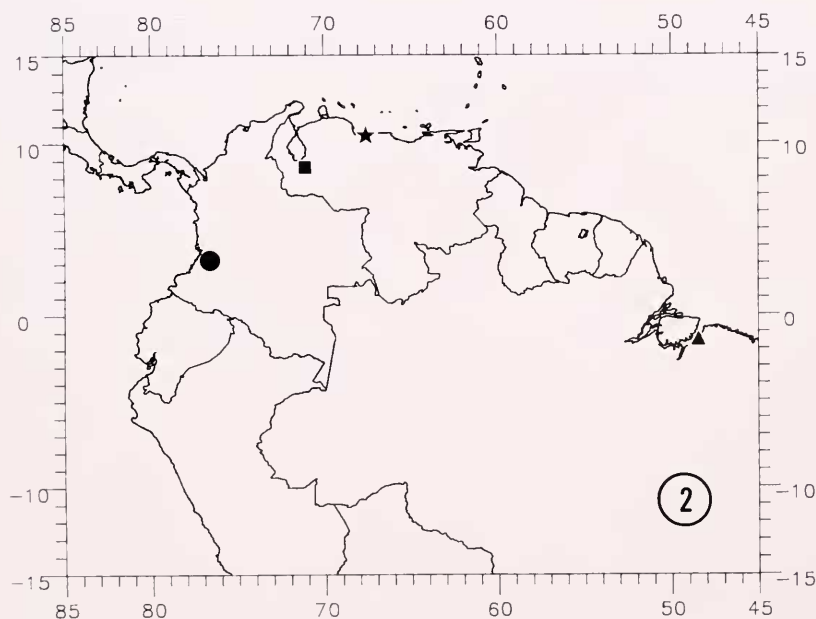
Somabrachyidae (Often Incorrectly Spelled *Somabrachidae*). One genus, *Somabrachys* Kirby, ranging from Morocco through North Africa to Syria, and South Africa (H. Geertsema, personal communication, 1985). Although earlier authors split *Somabrachys* into more than 20 species, Jordan (1916) and Hopp (1926; 1929: 50) divided it into only three variable species. Hering (1933: 198) described a subspecies, *S. infuscata robusta*, from Algeria, and Kruger (1934: 191) added a supposedly new species, *S. federzonii*, from Libya. *Somabrachys* has been variously included in Megalopygidae (e.g., Minet, 1986) or treated as a separate family; its relationships and biogeography need critical evaluation. *Psycharium* belongs here also (see later).

Zygaenidae (Including *Pyromorphidae*). Small to large moths with over 300 species placed in five to seven subfamilies, which are especially diverse in tropical Asia and may not be monophyletic. Alberti (1954) reviewed the classification and morphology of the family. Naumann *et al.* (1984) reviewed the large Palearctic genus *Zygaena* (see also Tremewan, 1988). Only the subfamily Procridinae occurs in the New World, the genera of which were revised by Tarmann (1984).

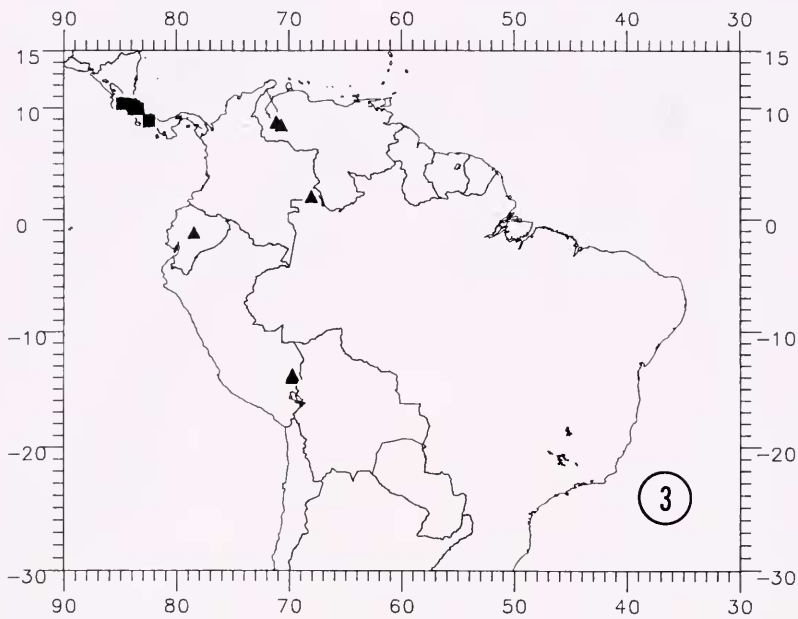
Genera of Doubtful Placement. The placement of these (and other) monotypic African genera has been disputed and emphasizes the problems in family level classification of the Zygaenoidea: *Boisduvalodes* Viette (replacement name for *Perrotia* Oberthur, 1922, not 1916), from Madagascar, originally placed in Megalopygidae, transferred to Zygaenidae by Jordan (1928: 132), to Limacodidae by Paulian (1961: 191) and Viette (1965: 121; 1980: 150) on advice of E. M. Hering, and to Somabrachyidae by Tremewan (1973: 136) on advice of W. H. T. Tams. *Psycharium* Herrich-Schäffer, from South Africa, was placed in Megalopygidae by Hopp (1928b: 445) and Zygaenidae by Jordan (1928: 136) and transferred to Somabrachyidae by Tremewan (1973: 139) on advice of Tams. Unfortunately, Tams and Hering never published the reasons for their placements of these genera.



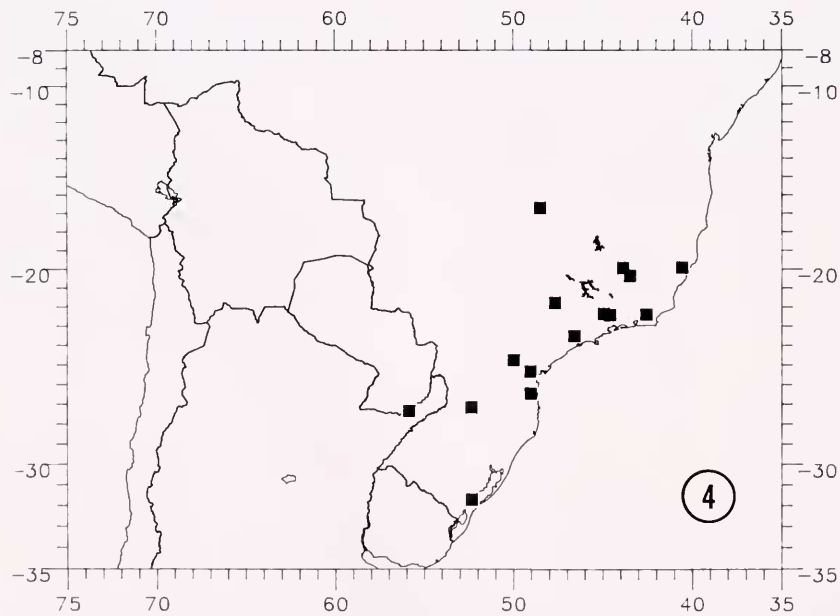
Map 1. Distribution of *Acraga goes*.



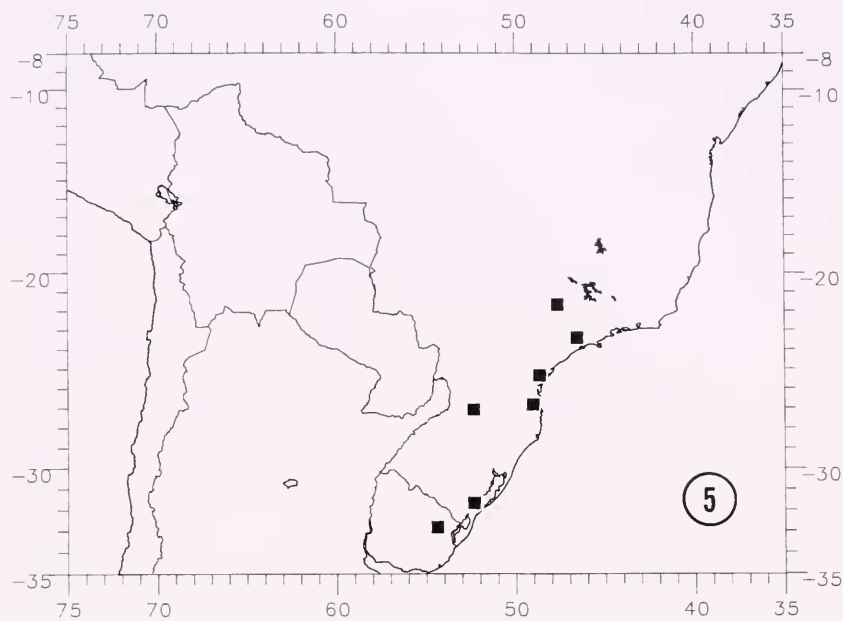
Map 2. Distribution of *Acraga ingenesens* (square), *A. luteola* (triangle), *A. beebei* (star), and *Acraga* new species F (circle).



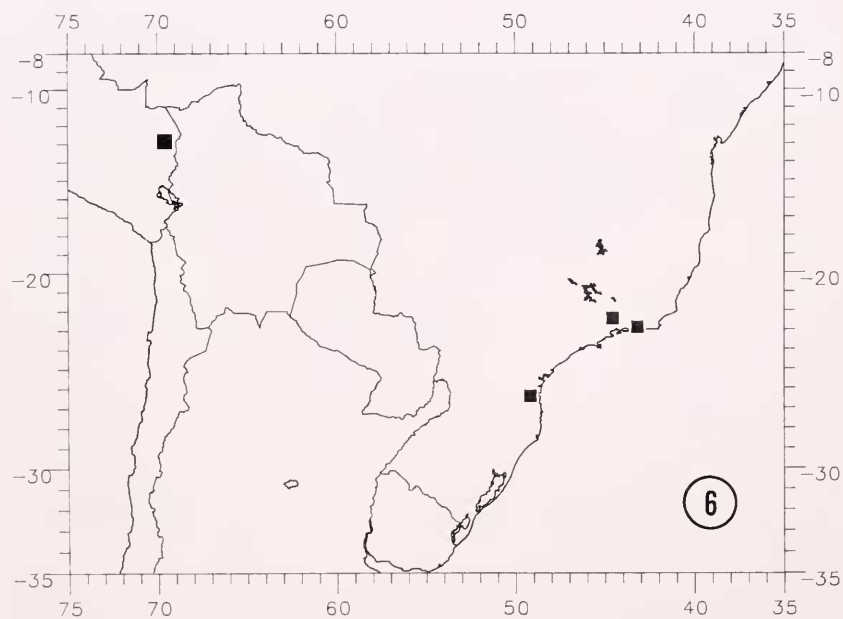
Map 3. Distribution of *Acraga hamata* (squares) and *A. andina* (triangles).



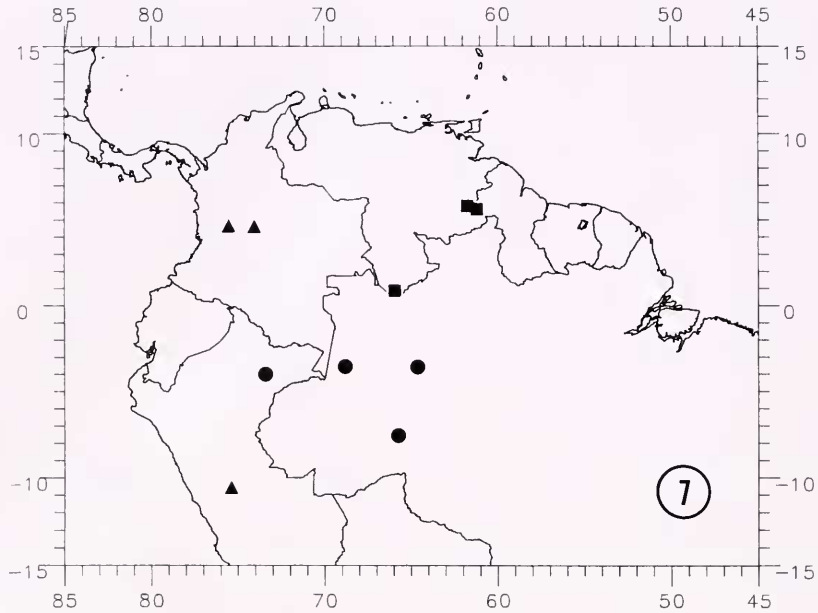
Map 4. Distribution of *Acraga flava*.



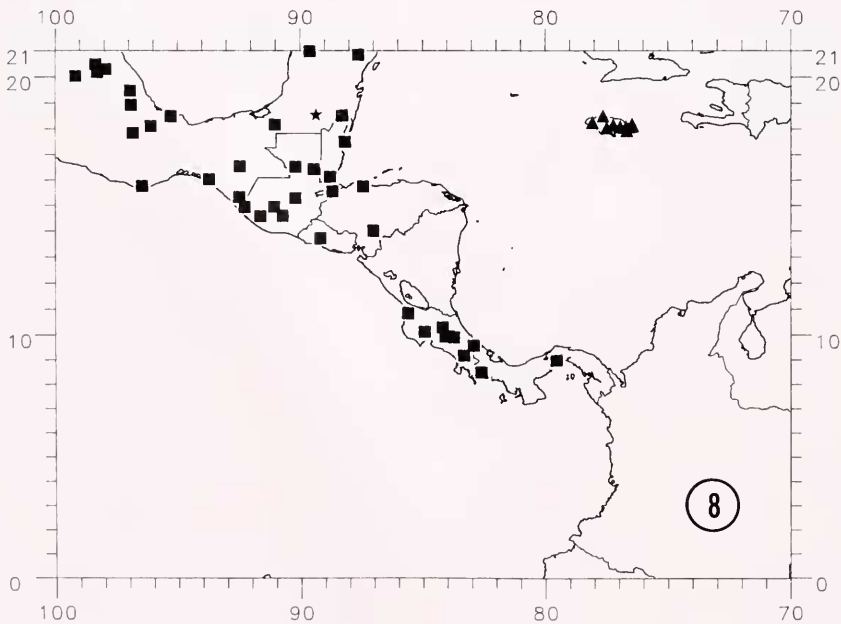
Map 5. Distribution of *Acraga obscura*.



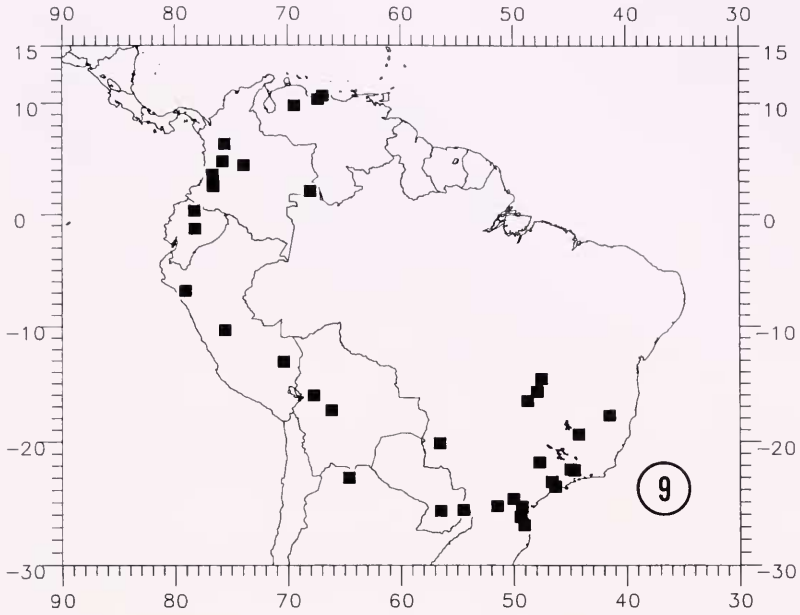
Map 6. Distribution of *Acraga ria*.



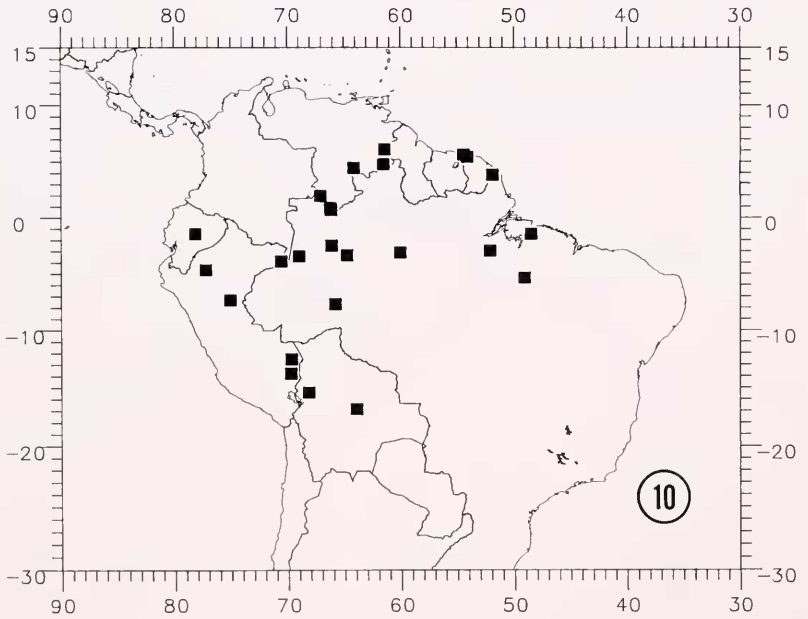
Map 7. Distribution of *Acraga neblina* (squares), *A. perbrunnea* (triangles), and *A. serrata* (circles).



Map 8. Distribution of *Acraga coa* (squares), *A. ciliata* (triangles), and *A. chicana* (star).

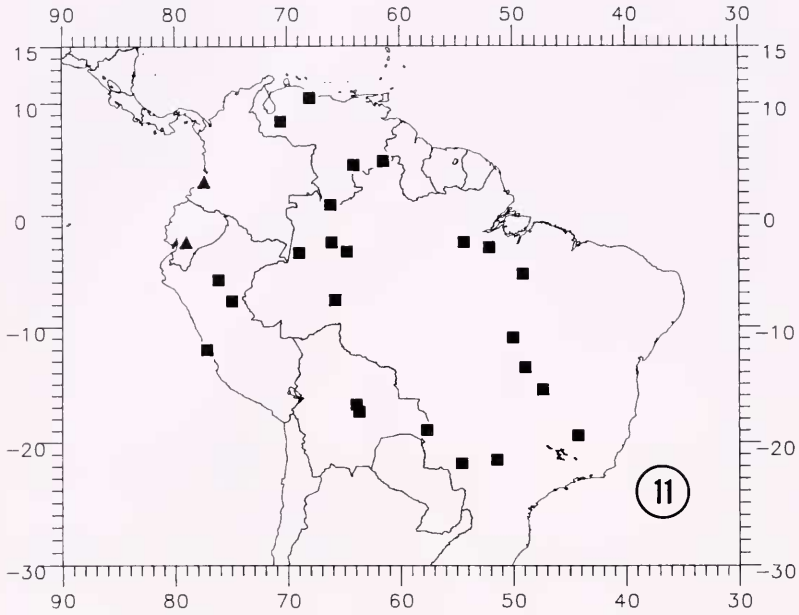


Map 9. Distribution of *Acraga moorei*.

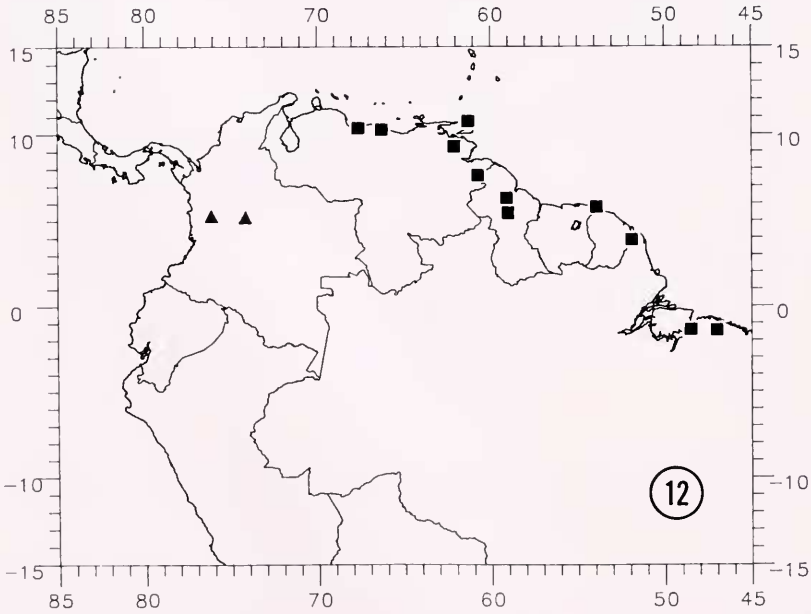


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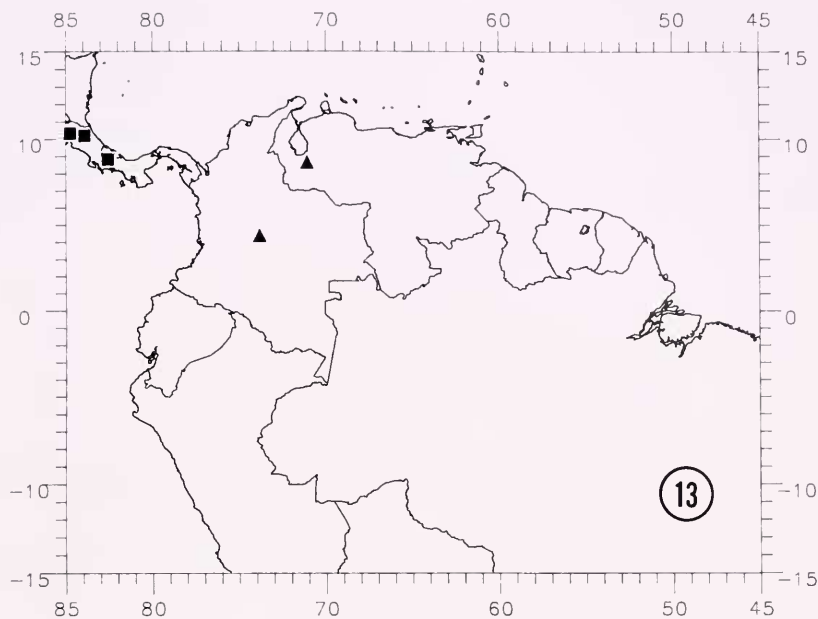
Map 10. Distribution of *Acraga concolor*.



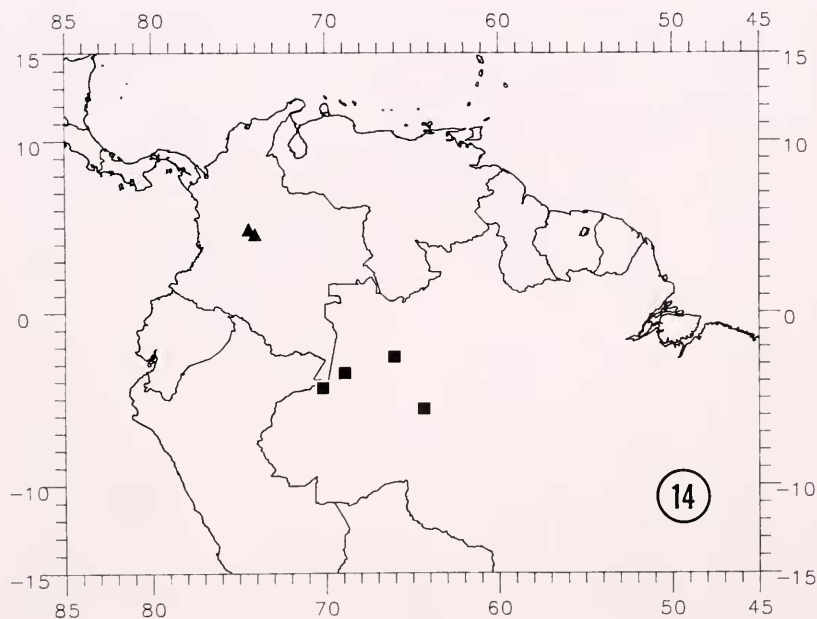
Map 11. Distribution of *Acraga citrinopsis* (squares) and *A. hoppiana* (triangles).



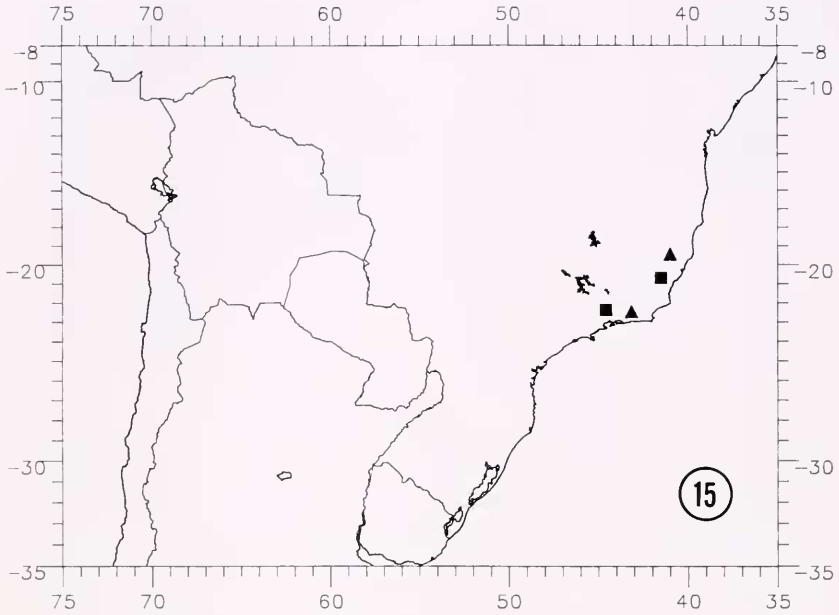
Map 12. Distribution of *Acraga citrina* (squares) and *Acraga* species C (triangles).



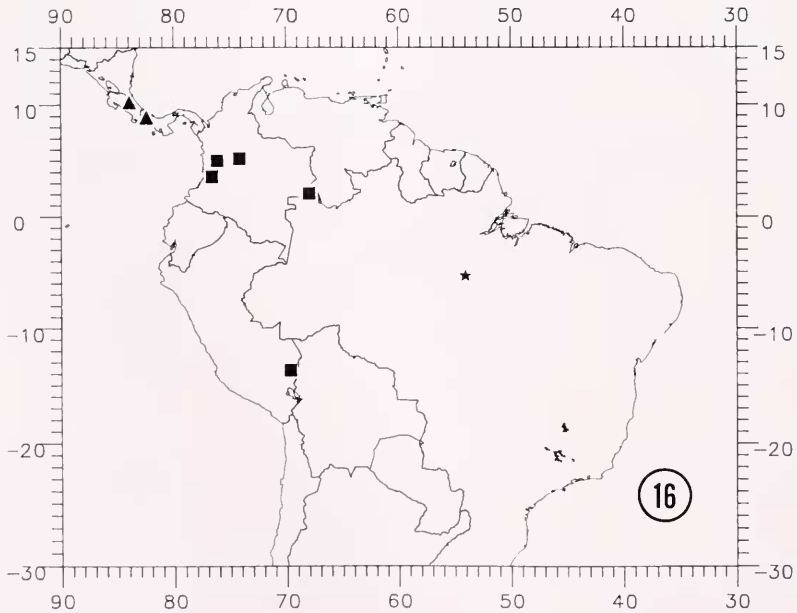
Map 13. Distribution of *Acraga melinda* (squares) and *A. meridensis* (triangles).



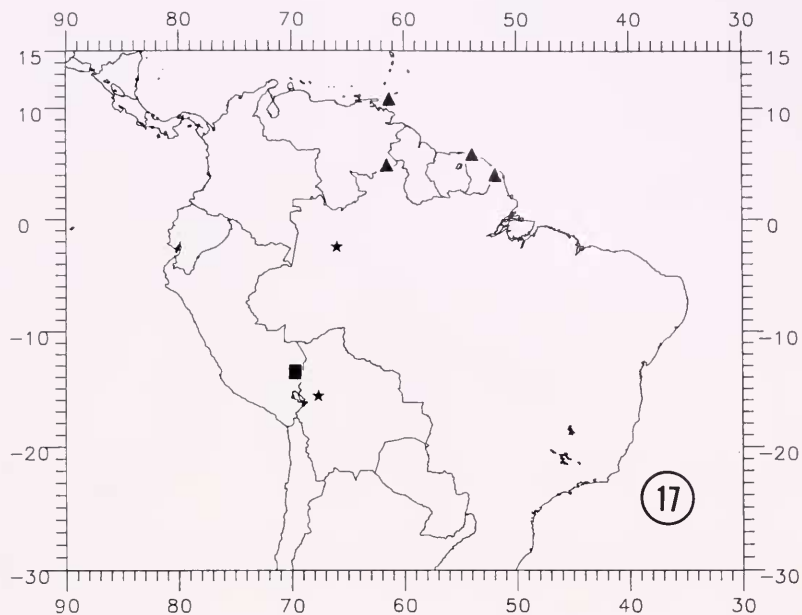
Map 14. Distribution of *Acraga amazonica* (squares) and *A. marialis* (triangles).



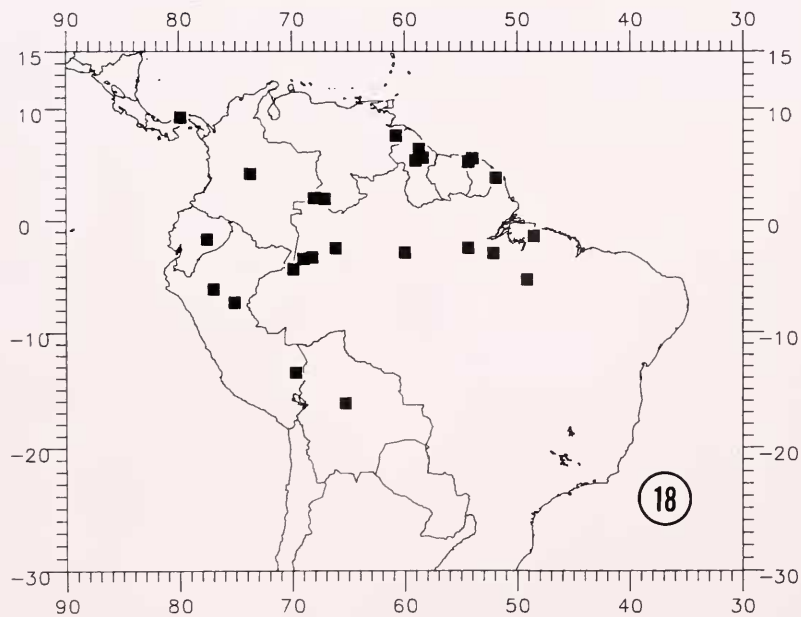
Map 15. Distribution of *Acraga ferruginea* (squares) and *A. brunnea* (triangles).



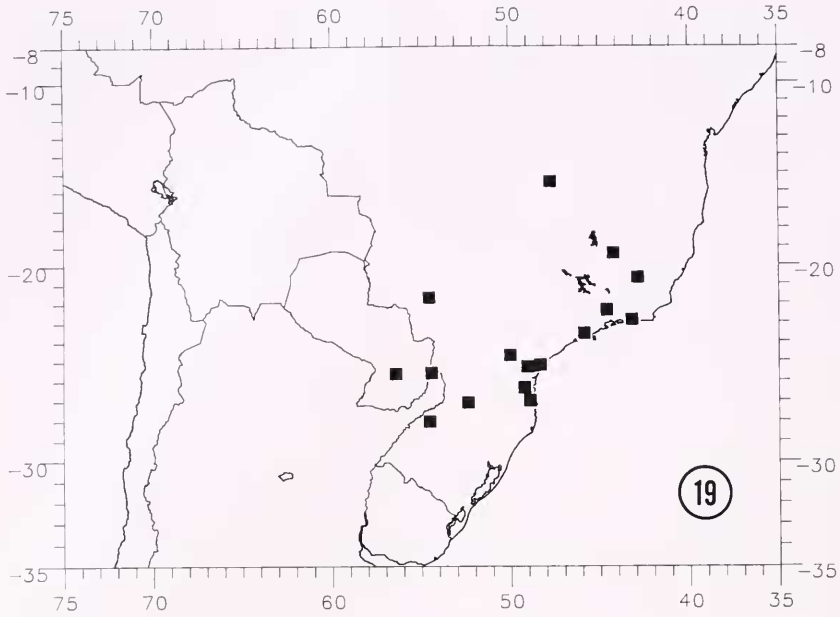
Map 16. Distribution of *Acraga ampela* (squares), *A. isothea* (triangles), and *A. umbrifera* (star).



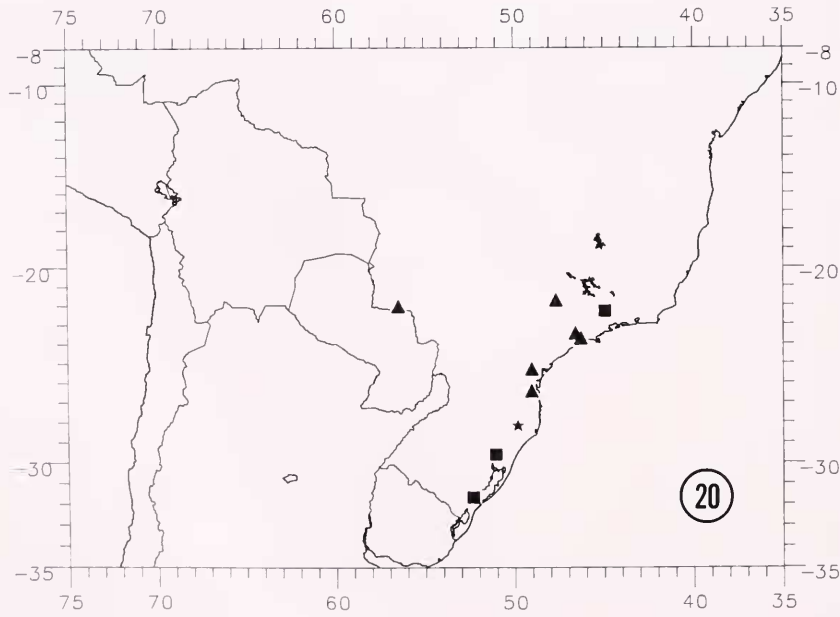
Map 17. Distribution of *Acraga puno* (square), *A. angulifera* (triangles), and *A. boliviana* (stars).



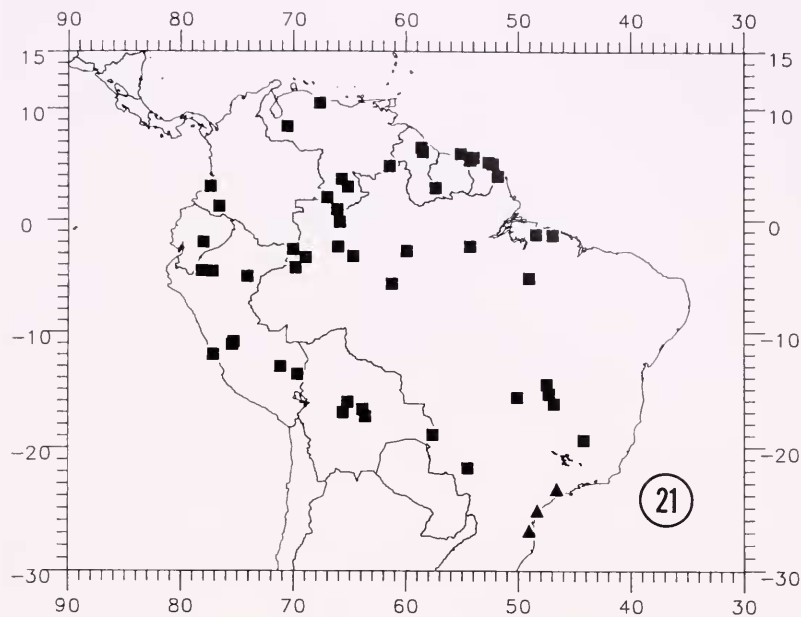
Map 18. Distribution of *Acraga leberna*.



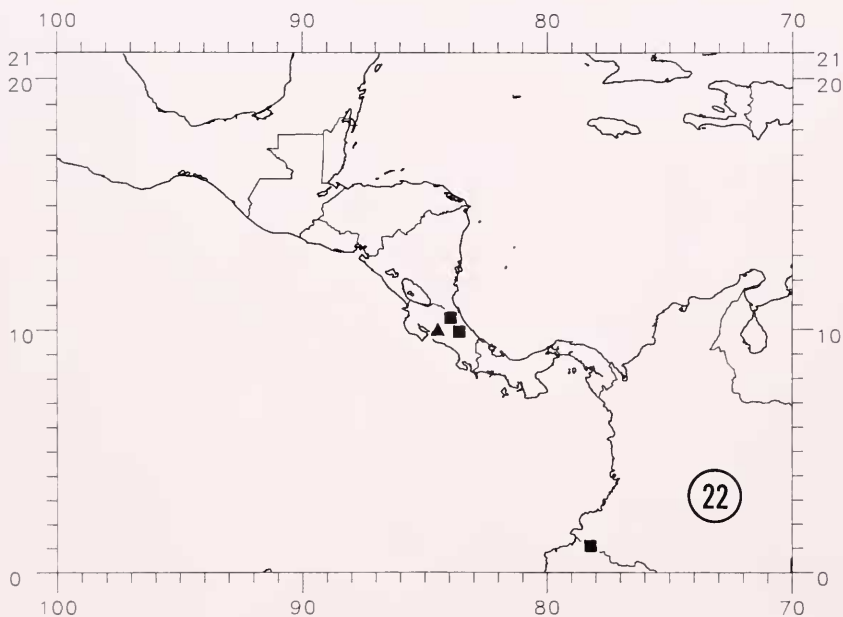
Map 19. Distribution of *Acraga ochracea*.



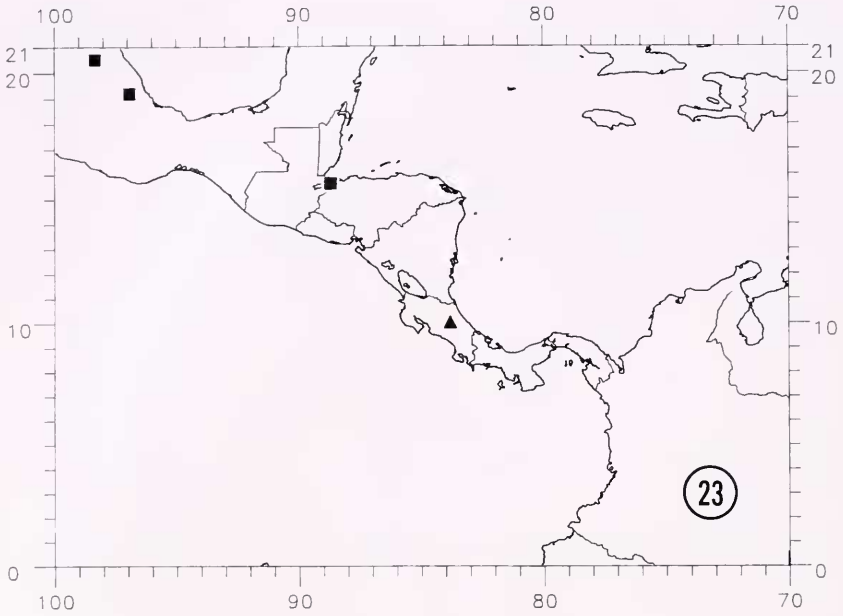
Map 20. Distribution of *Acraga sexquicentenaria* (squares), *A. parana* (triangles), and *A. victoria* (star).



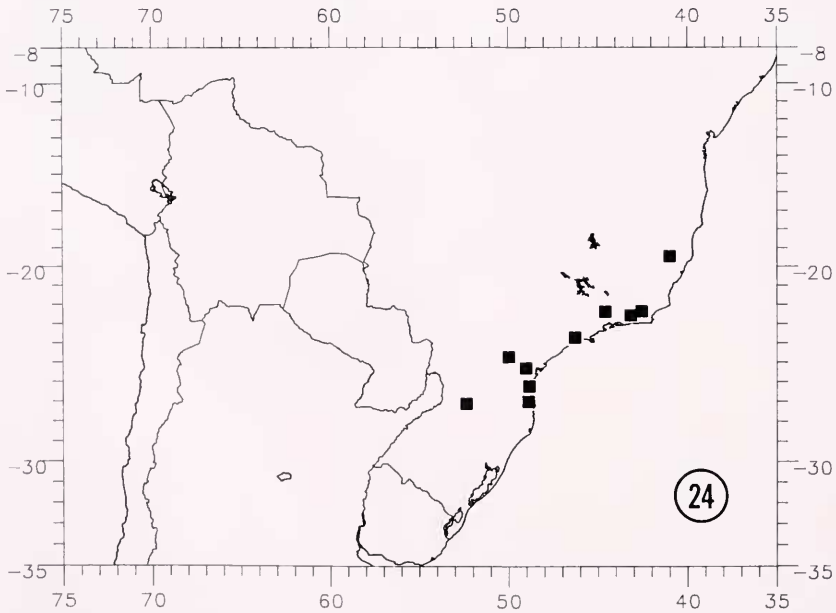
Map 21. Distribution of *Dalcerides flavetta* (squares) and *D. nana* (triangles).



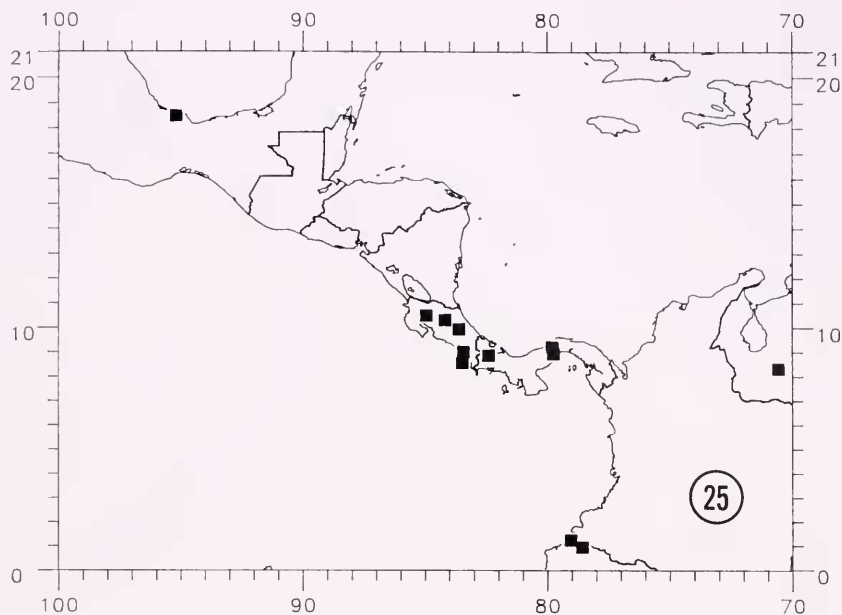
Map 22. Distribution of *Dalcerides rebella* (squares) and *D. bicolor* (triangle).

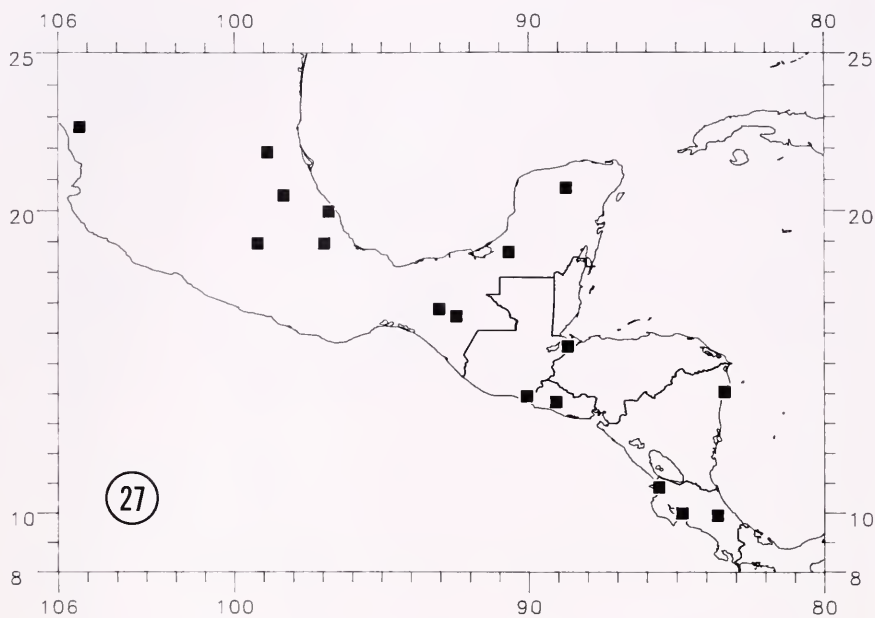
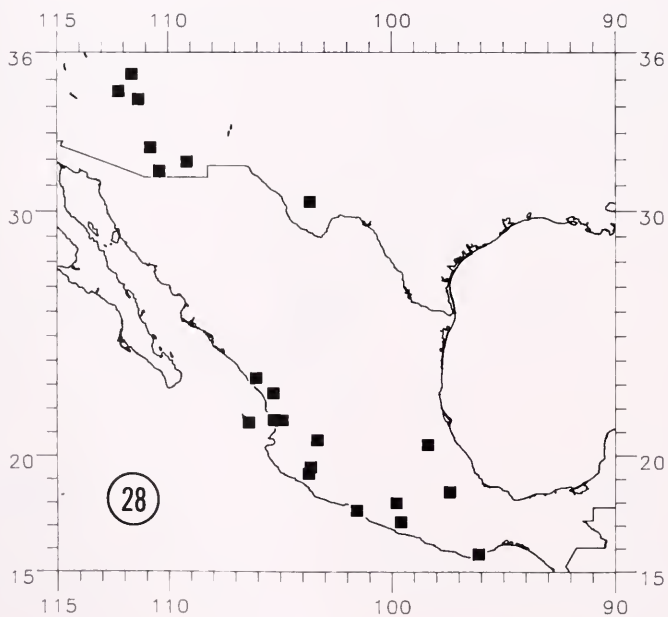


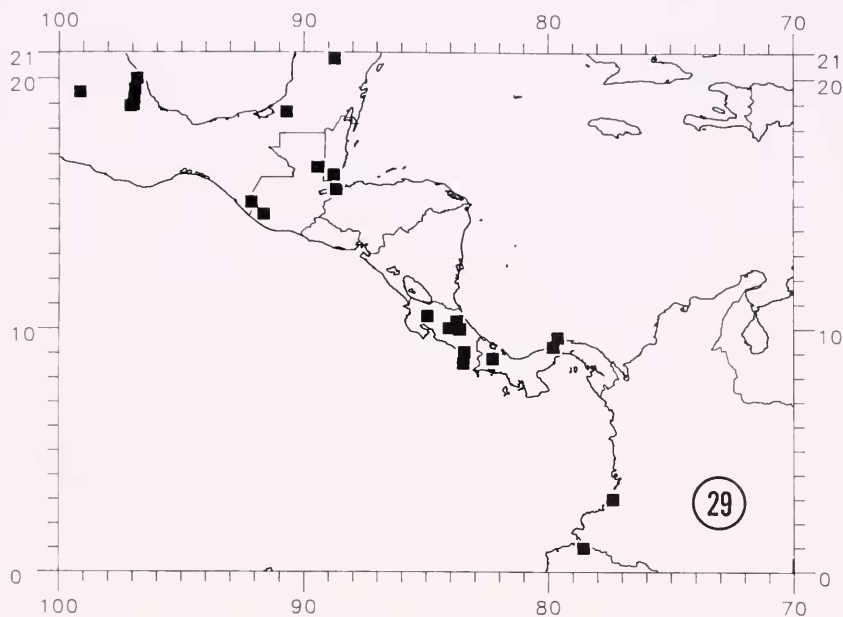
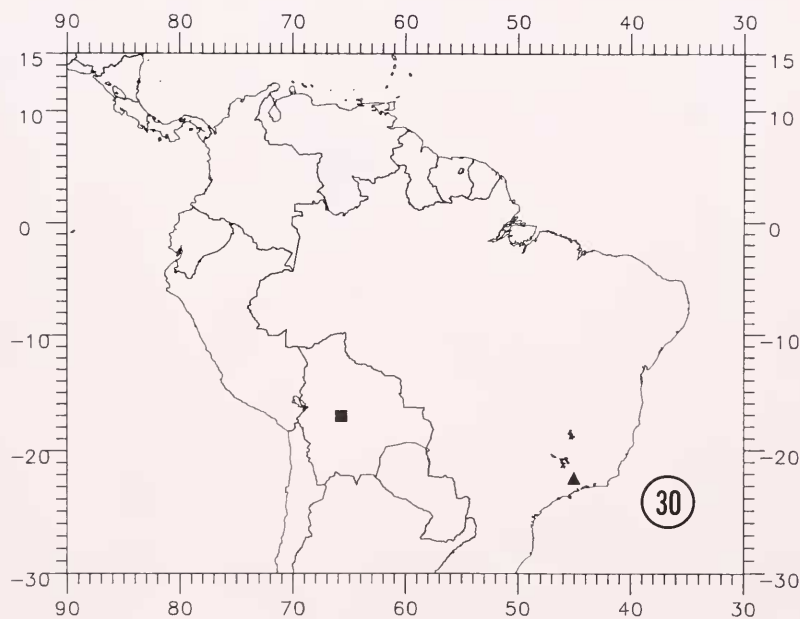
Map 23. Distribution of *Dalcerides chirma* (squares) and *D. new species* (triangle).

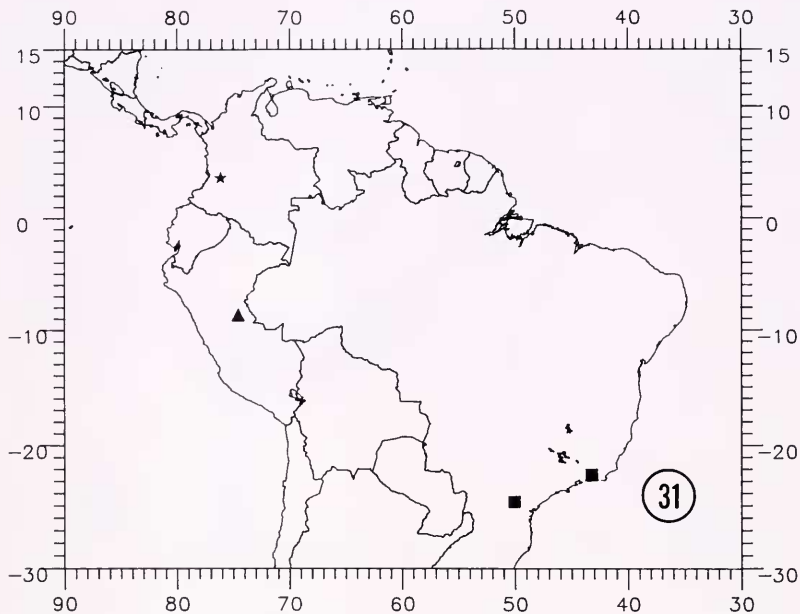


Map 24. Distribution of *Dalcerides radians*.

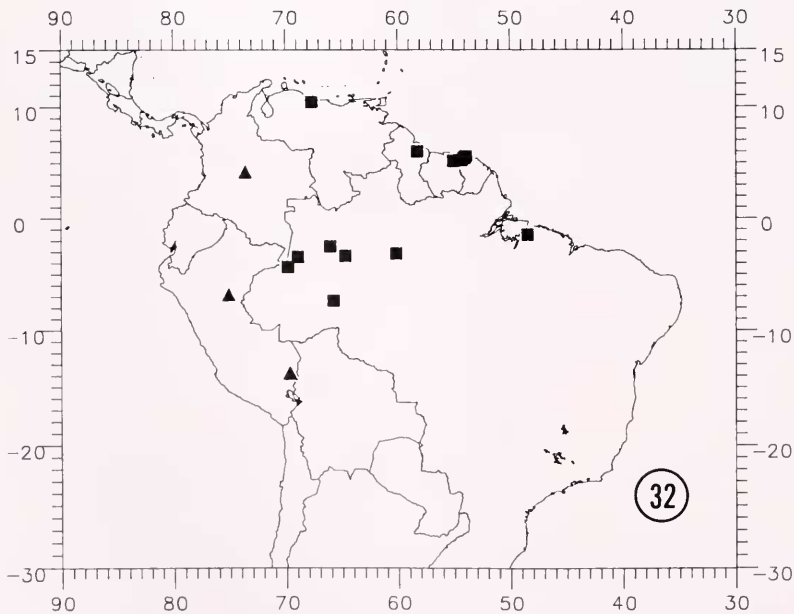
Map 25. Distribution of *Dalcerides dulciola*.Map 26. Distribution of *Dalcerides mesoa*.

Map 27. Distribution of *Dalcerides sofia*.Map 28. Distribution of *Dalcerides ingenita*.

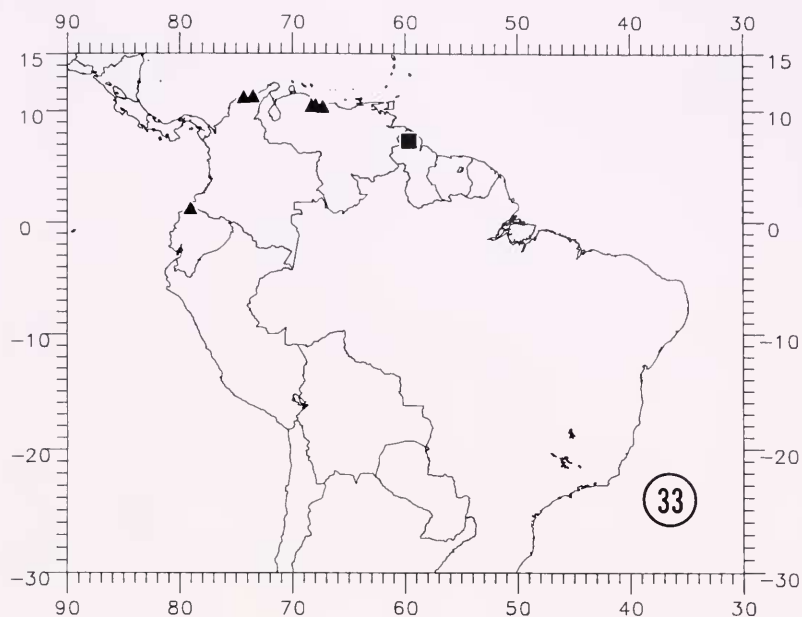
Map 29. Distribution of *Dalcides alba*.Map 30. Distribution of *Zikanyrops dubiosa* (square) and *Z. sparsa* (triangle).



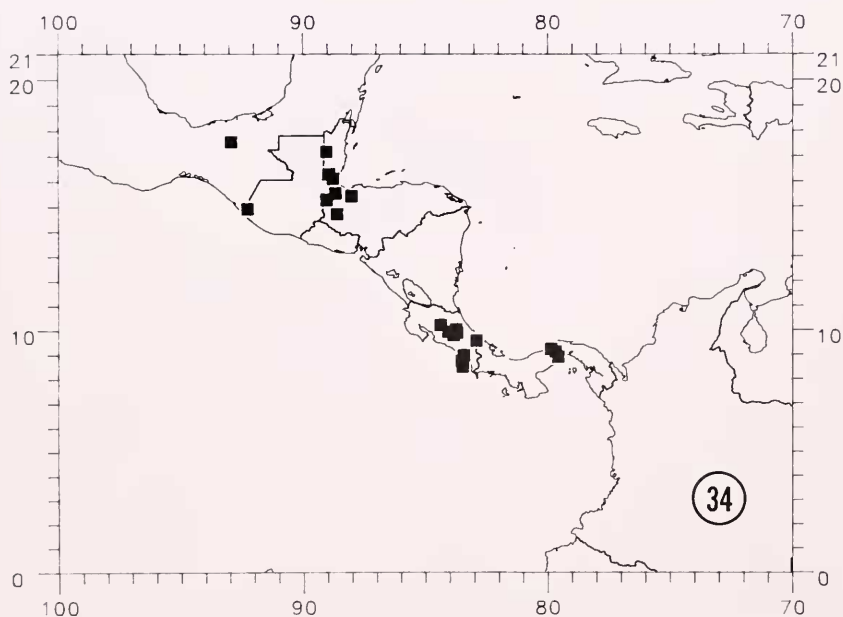
Map 31. Distribution of *Minonoa perbella* (squares), *M. pachitea* (triangle), and *M. elvira* (star).



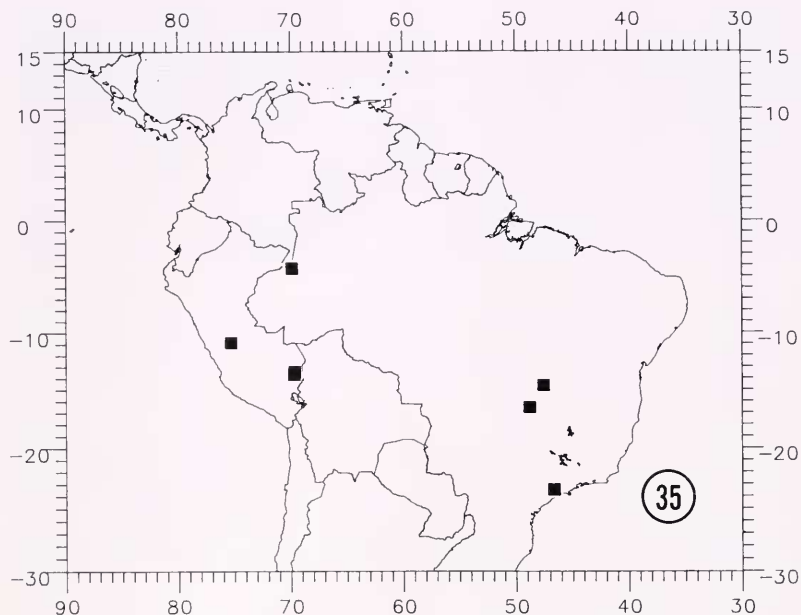
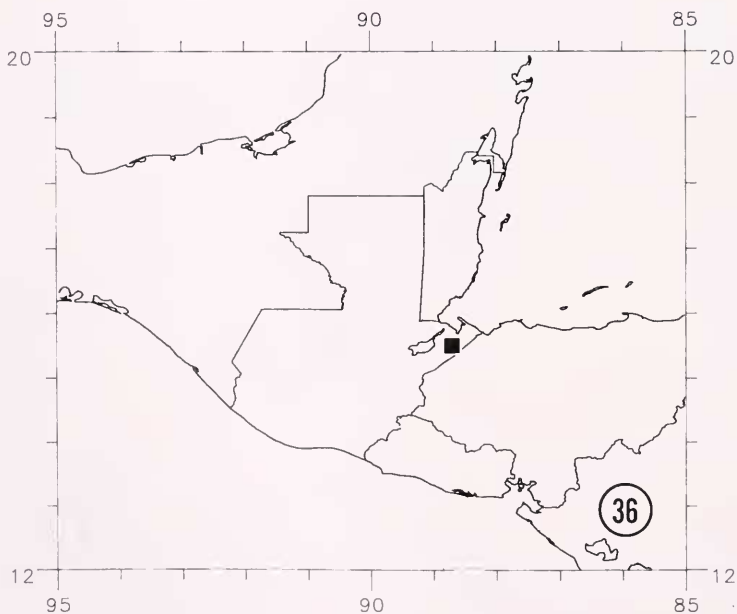
Map 32. Distribution of *Paracrags innocens* (squares) and *P. canalicula* (triangles).

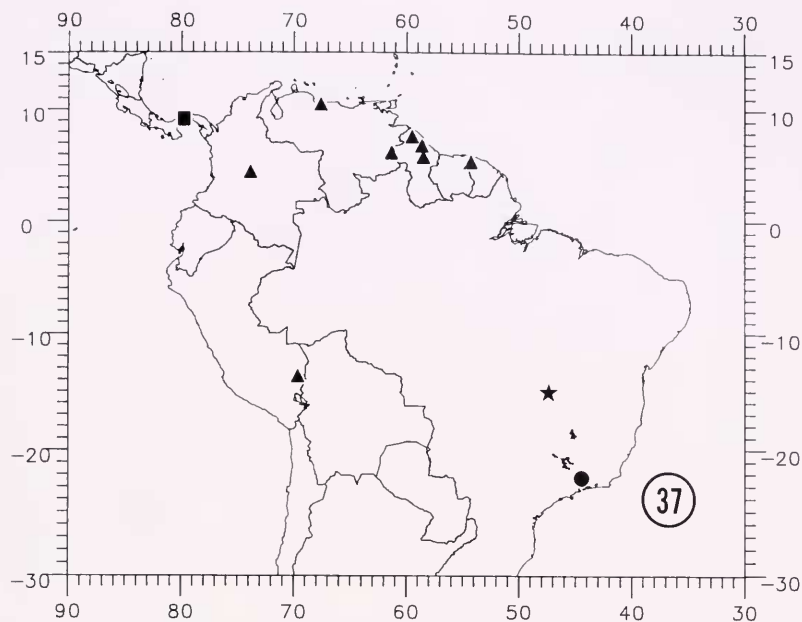


Map 33. Distribution of *Paracraga necoda* (triangles), and *P. amianta* (square).

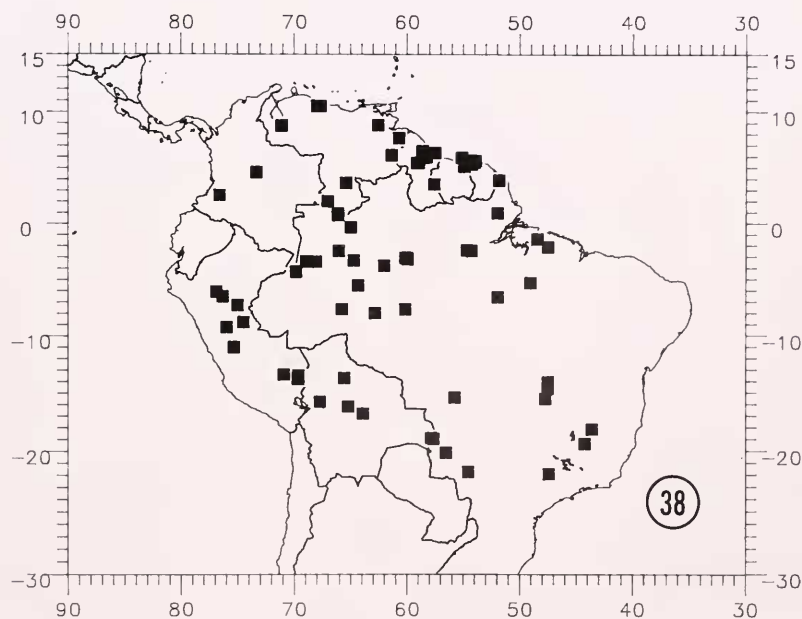


Map 34. Distribution of *Paracraga argentea*.

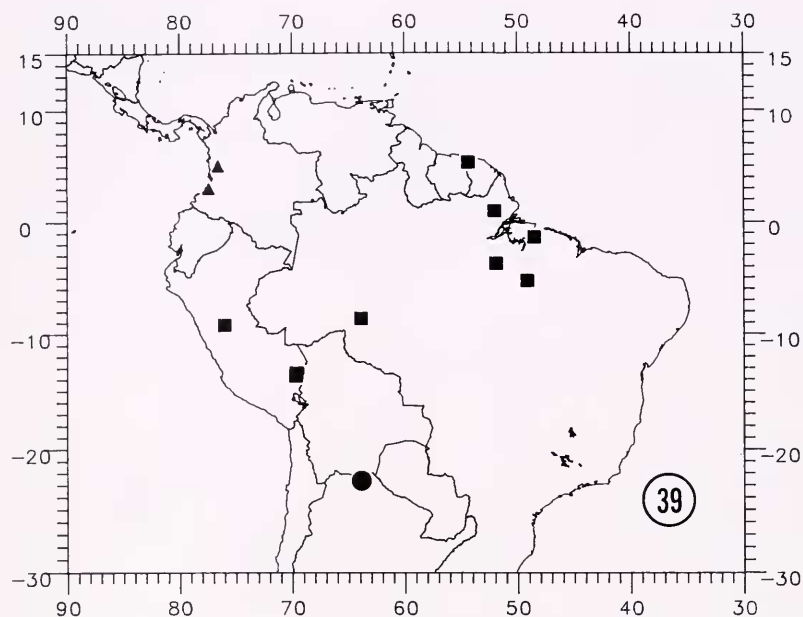
Map 35. Distribution of *Paracraga halophora*.Map 36. Distribution of *Paracraga pulverina*.



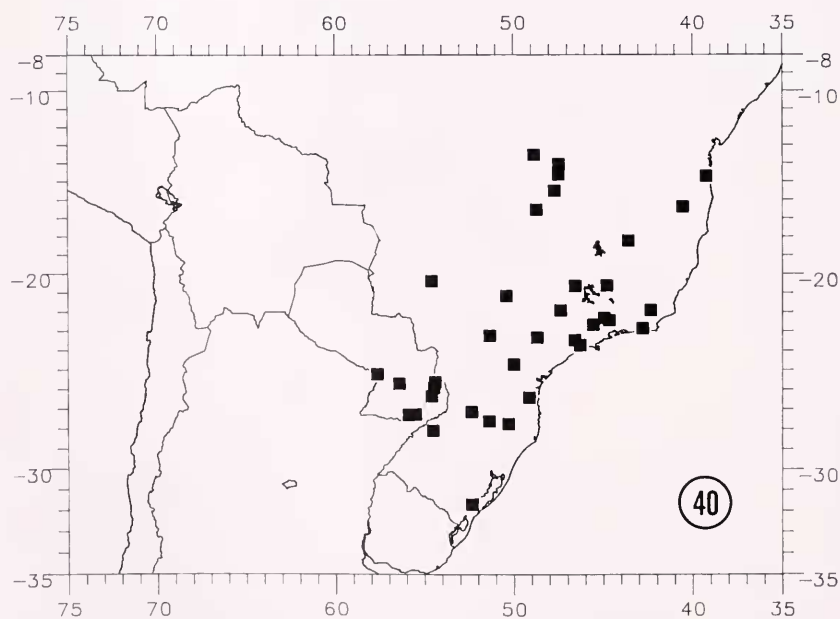
Map 37. Distribution of *Ca anastigma* (square), *Minacragides arnaxis* (triangles), *Minacragides new species A* (circle), and *Minacragides new species B* (star).



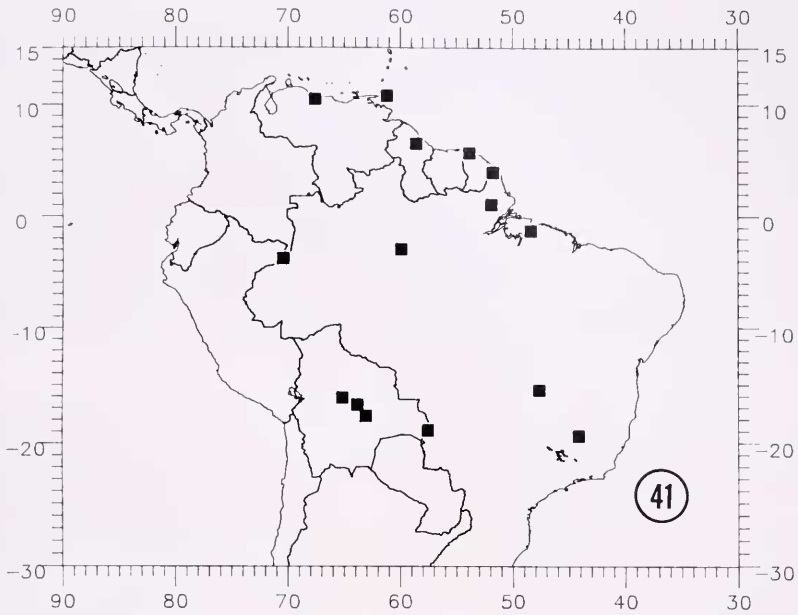
Map 38. Distribution of *Dalcera abrasa*.



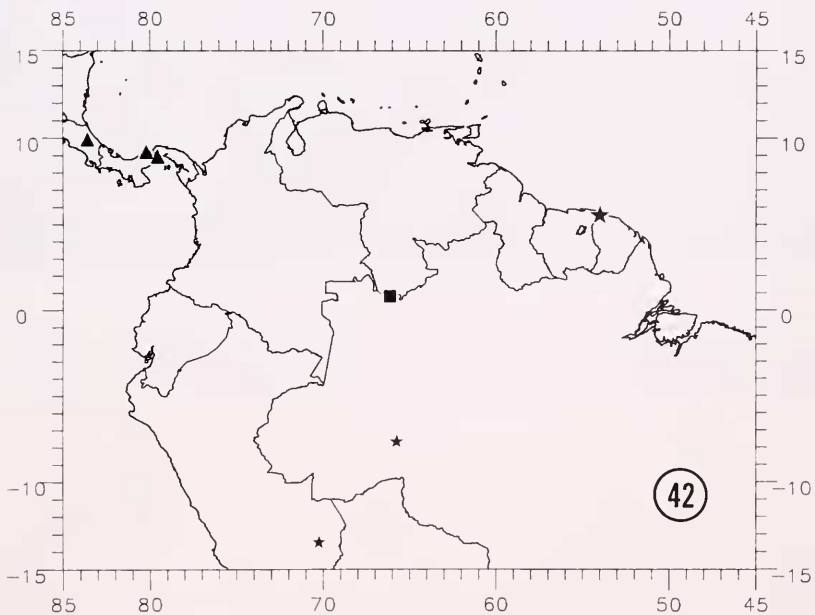
Map 39. Distribution of *Dalcera canescens* (squares), *D. semirufa* (triangles), and *D. haywardi* (circle).



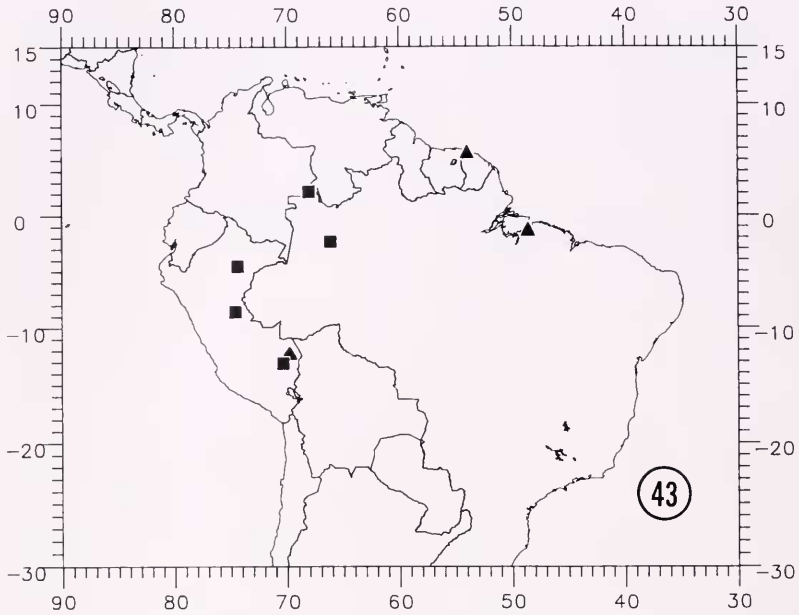
Map 40. Distribution of *Dalcerina tijucana*.



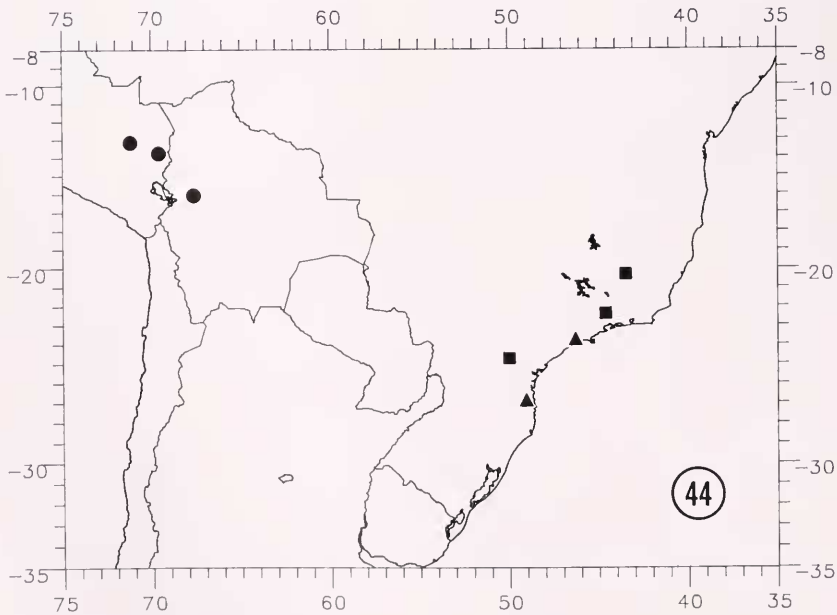
Map 41. Distribution of *Minacraga disconitens*.



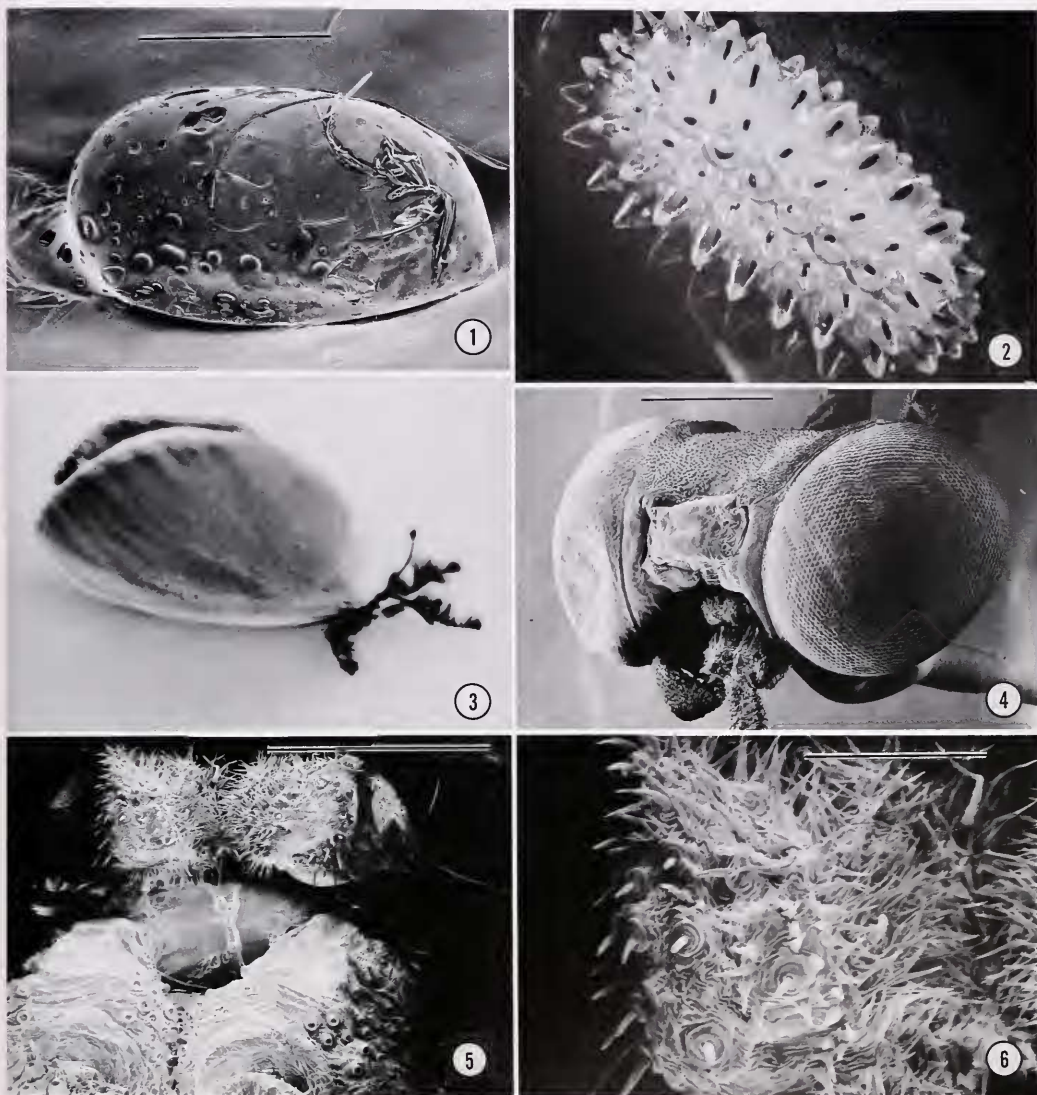
Map 42. Distribution of *Minacraga similis* (square), *M. plata* (triangles), and *M. hyalina* (stars).



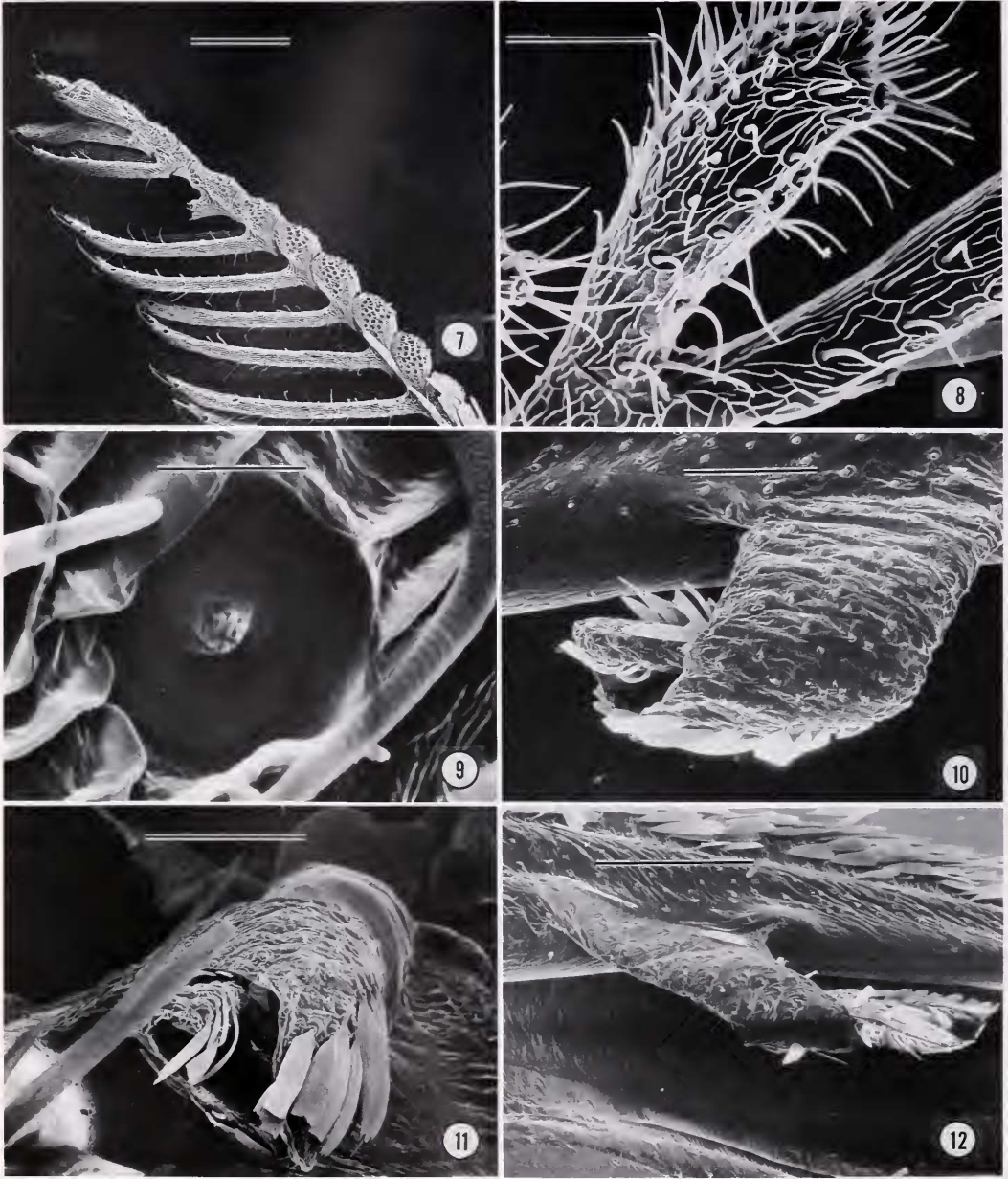
Map 43. Distribution of *Minacraga argentata* (squares) and *M. indiscata* (triangles).



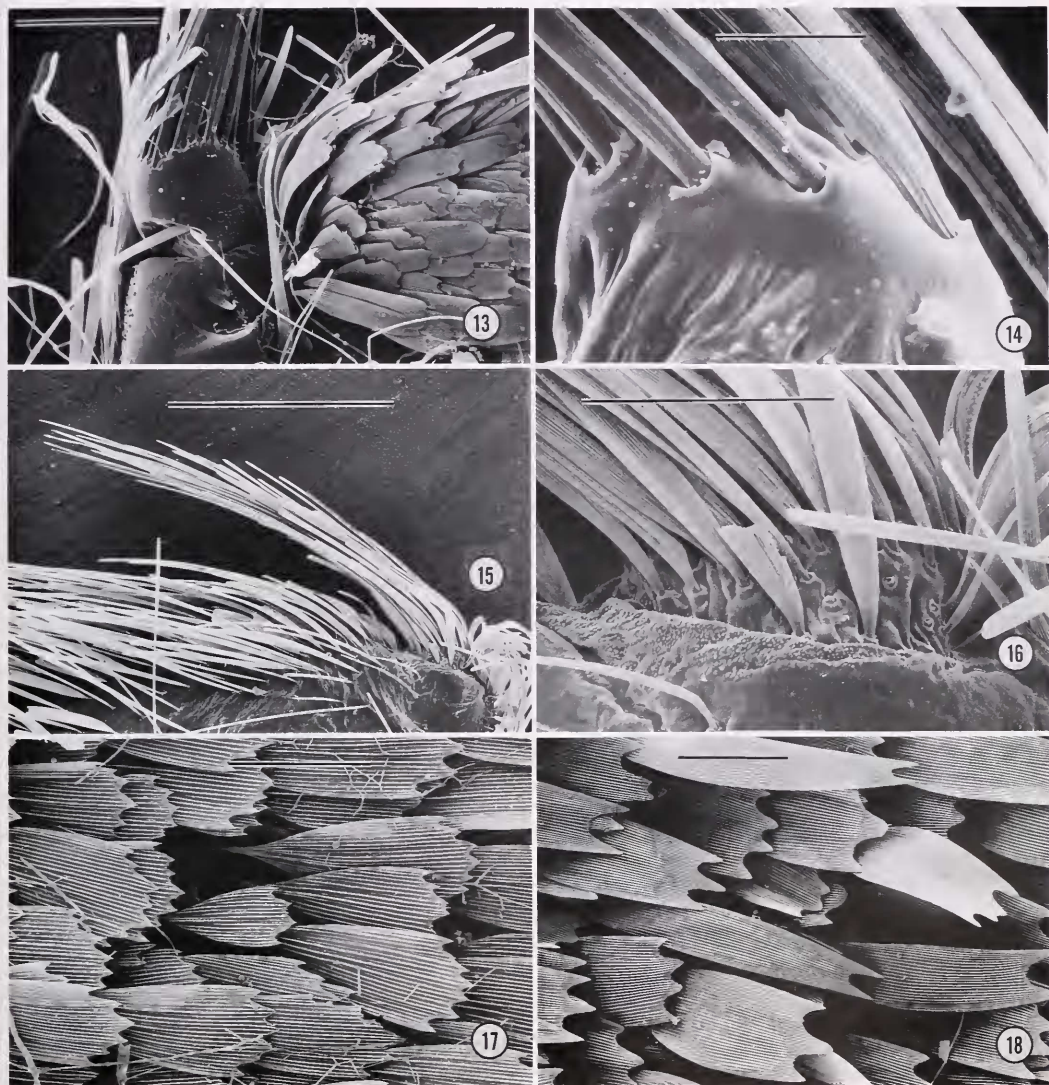
Map 44. Distribution of *Minacraga itatiaia* (squares), *M. aenea* (triangles), and *Oroya aurora* (circles).



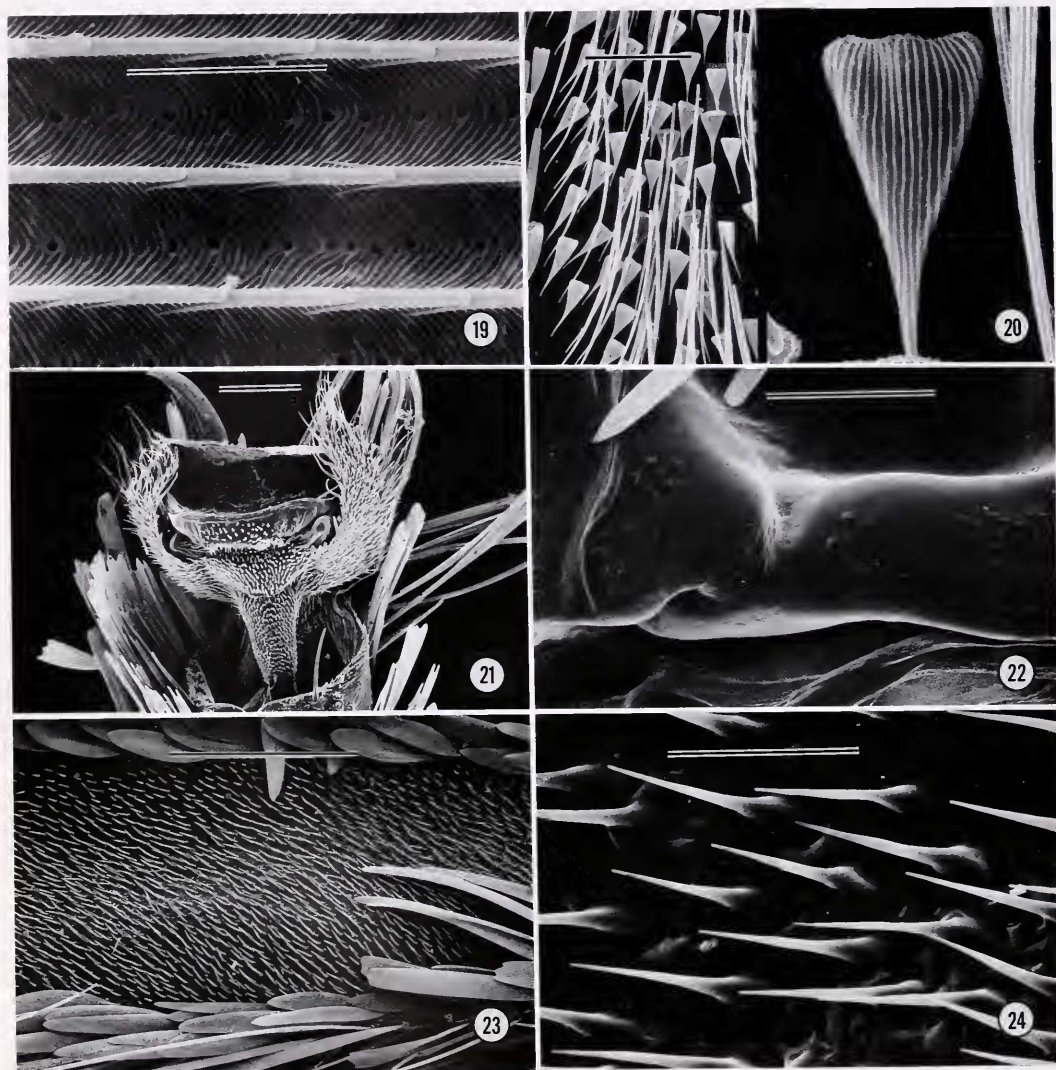
Figures 1-6. Figure 1. Egg of *Dalcerina tijucana*, laid by female reared from eggs laid by female from Maricá, Rio de Janeiro, Brazil; egg was carbon- and gold-coated when freshly laid; scale = 0.5 mm. Figure 2. Late-instar larva of *Dalcerina tijucana*, reared from eggs from Maricá, Brazil. Figure 3. Live *Dalcerina tijucana* female, reared from eggs from Maricá, Brazil, showing typical resting posture. Figure 4. Head of *Acraga moorei* male; scale = 0.5 mm. Figure 5. Enlargement of mouthparts of *Acraga moorei* male; scale = 200 μ m. Figure 6. Enlargement of vestigial maxillary palpi of *Acraga moorei* male; scale = 50 μ m.



Figures 7–12. Figure 7. Antenna of *Dalcera abrasa* male, with scales removed; scale = 200 μ m. Figure 8. Antenna of *Dalcerides ingenua* male, with scales removed; scale = 43 μ m. Figure 9. Sensillum coeloconicum on antenna of *Dalcerides ingenua* male; scale = 4 μ m. Figure 10. Retinaculum of *Dalcerides ingenua* male, ventral view; scale = 100 μ m. Figure 11. Retinaculum of *Dalcerides ingenua* male, lateral view; scale = 100 μ m. Figure 12. Retinaculum of *Acraga citrina* male, ventral view; scale = 200 μ m.



Figures 13–18. Figure 13. Frenulum base of *Minacraga disconitens* male; scale = 200 μ m. Figure 14. Frenulum base of *Dalcerides ingenuita* male; scale = 20 μ m. Figure 15. Frenulum *Dalcerides ingenuita* female; scale = 0.5 mm. Figure 16. Frenulum base of *Dalcerides ingenuita* female; scale = 100 μ m. Figure 17. Scales of *Minacraga disconitens* male, dorsal hindwing anal area; scale = 100 μ m. Figure 18. Scales of *Dalcera abrasa* male, dorsal forewing near discal spot; scale = 100 μ m.



Figures 19–24. Figure 19. Enlargement of Figure 18, showing "microrib-satin" scale structure; scale = 4 μ m. Figure 20. Mixed lamellar and piliform scales of *Acraga citrina* male, ventral forewing between M_2 and M_3 ; scale for left side = 200 μ m; right side is enlarged eight times. Figure 21. Foretarsus of *Dalcera abrasa* male; scale = 100 μ m. Figure 22. Campaniform sensilla on base of cubital stem on dorsal hindwing of *Acraga citrina* male; scale = 100 μ m. Figure 23. Microtrichia on ventral inner margin near base of *Dalcerides ingenita* male forewing; scale = 200 μ m. Figure 24. Enlargement of Figure 23; scale = 20 μ m.

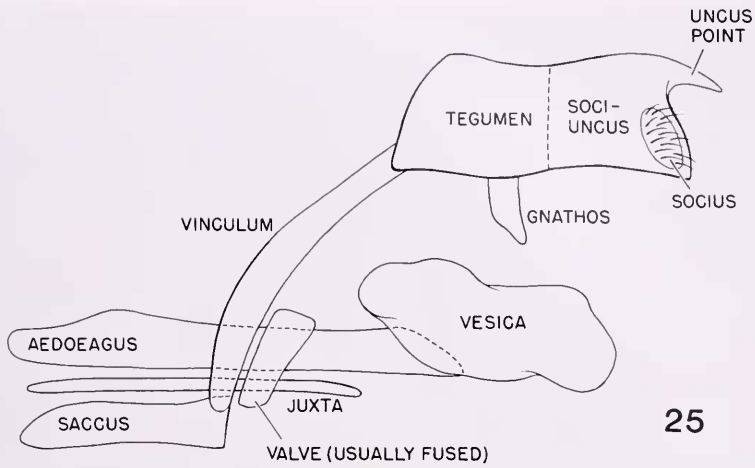


Figure 25. Diagrammatic male genitalia, lateral view, illustrating major morphological features.

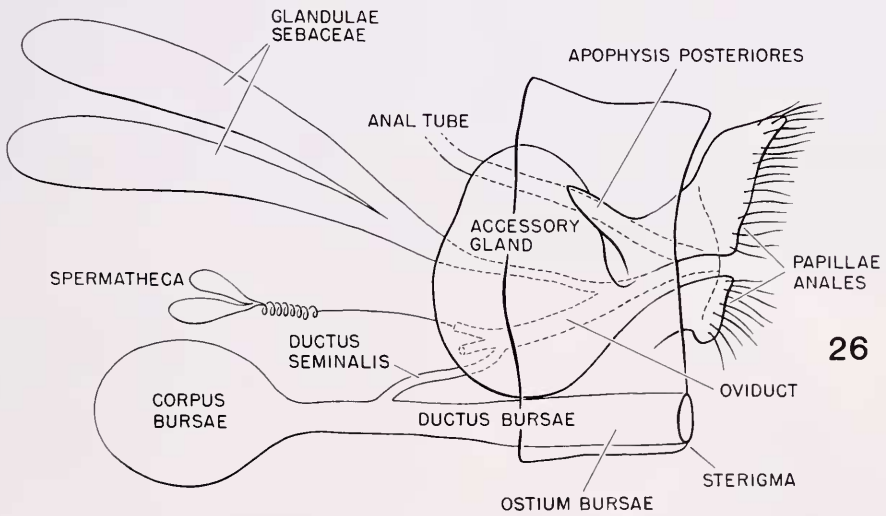
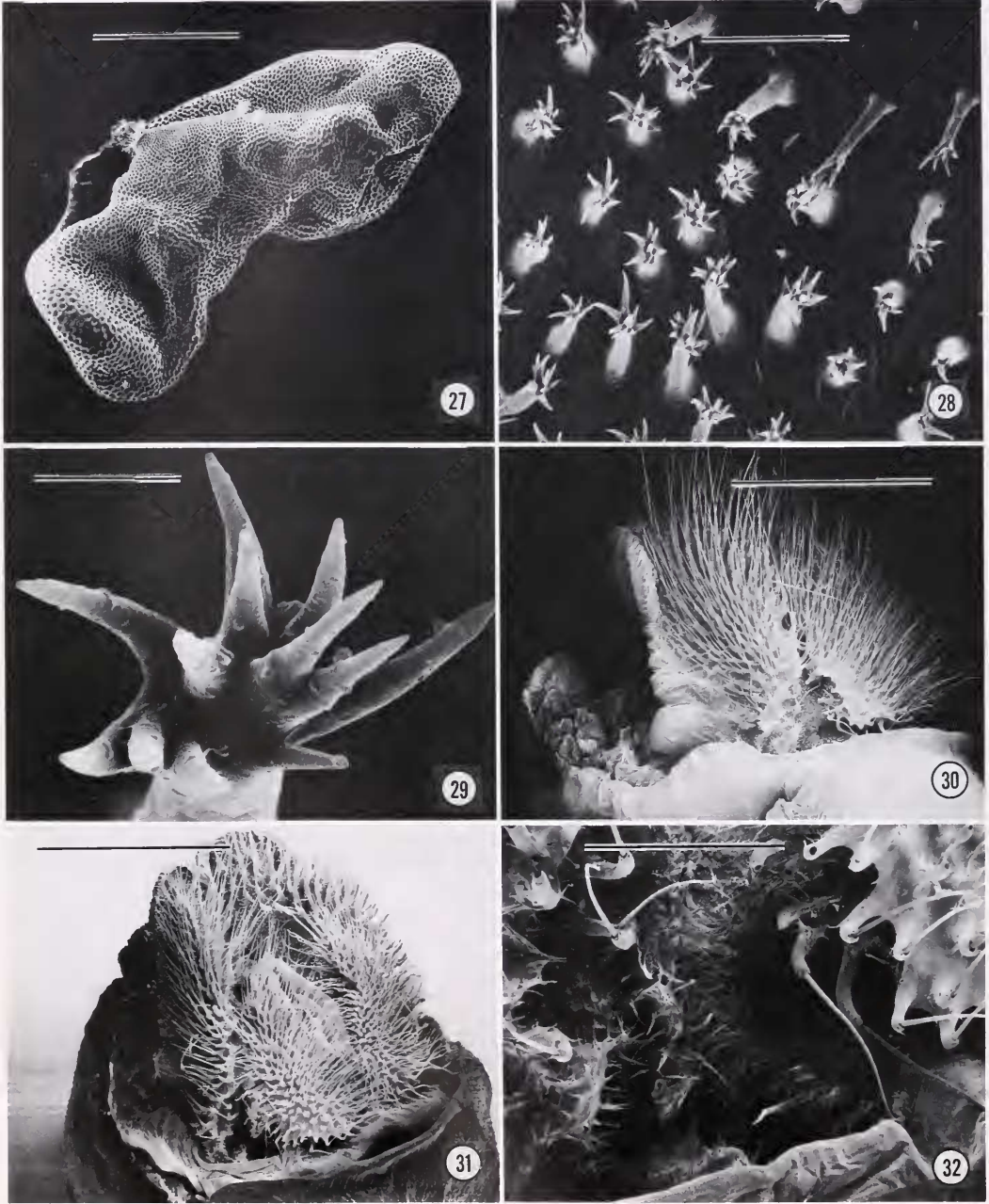


Figure 26. Diagrammatic female genitalia, lateral view, illustrating major morphological features.



Figures 27–32. Figure 27. "Accessory gland" from *Acraga coa* female; scale = 1 mm. Figure 28. Inside surface of "accessory gland" from *Acraga coa* female; scale = 60 μ m. Figure 29. Enlargement of Figure 28; scale = 8 μ m. Figure 30. Apex of abdomen of *Acraga coa* female, lateral view; scale = 1 mm. Figure 31. Apex of abdomen of *Acraga coa* female, oblique view; scale = 1 mm. Figure 32. Enlargement of cleft between lobes of papillae anales from Figure 31; scale = 200 μ m.

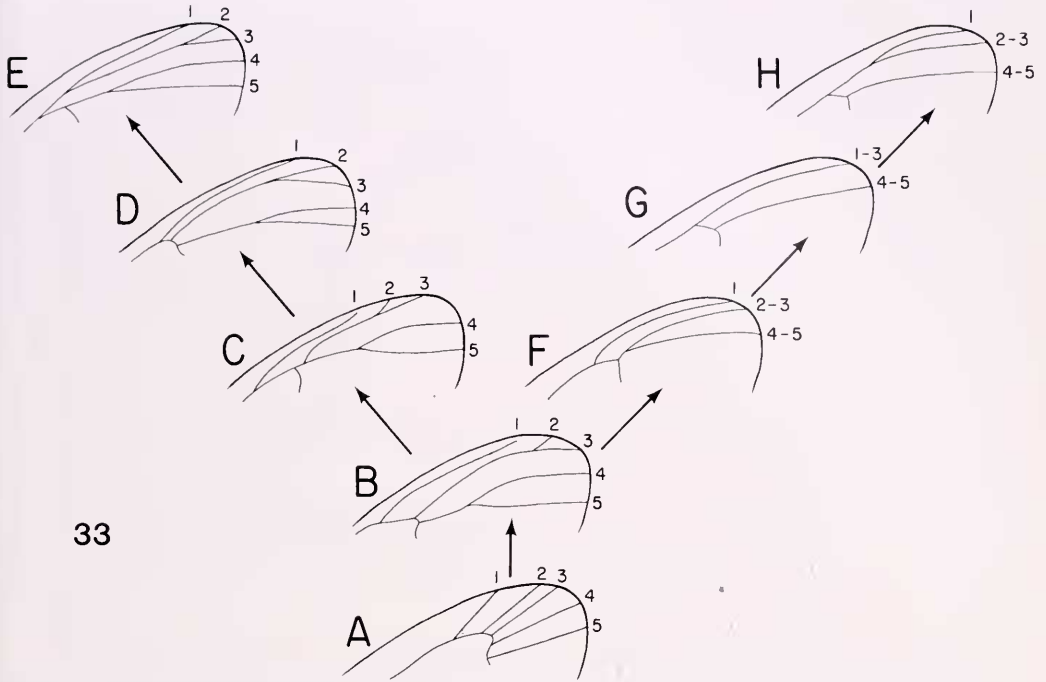


Figure 33. Hypothesized transformation series for forewing radial vein system. See *Ca* and *Minacragides* generic treatments for discussion of assignments of homologies in states G and H.

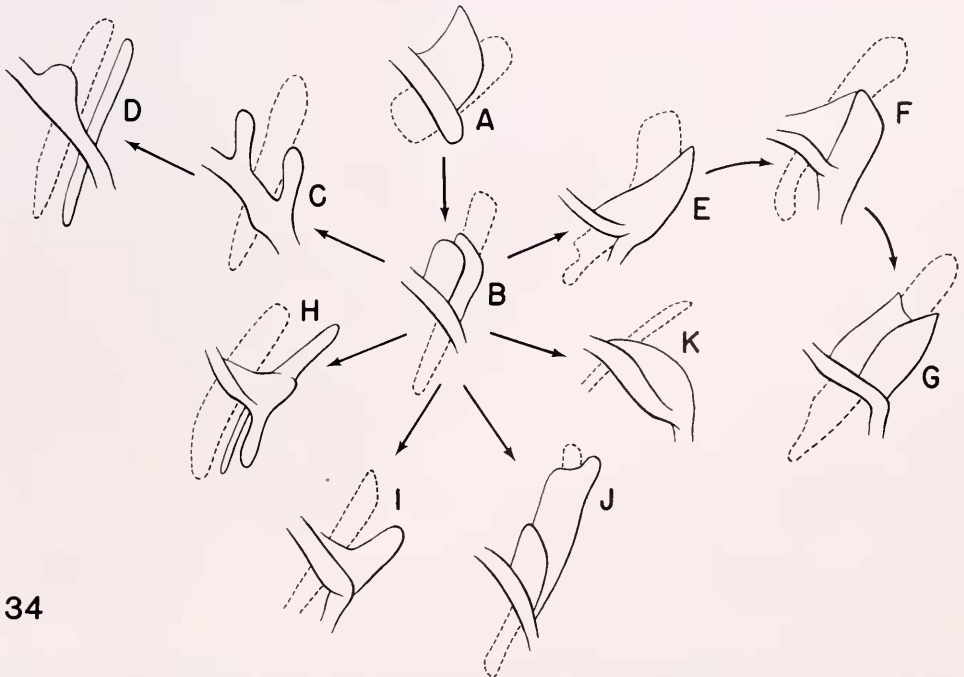


Figure 34. Hypothesized transformation series for juxta-valval region, illustrated in lateral view with dotted aedeagus outline for perspective.

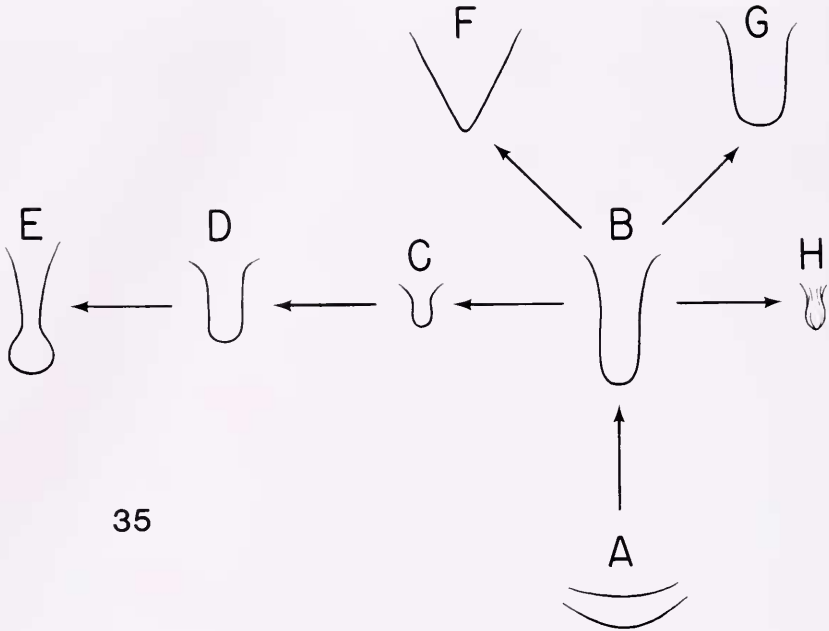


Figure 35. Hypothesized transformation series for saccus shape, illustrated as outline from ventral view.

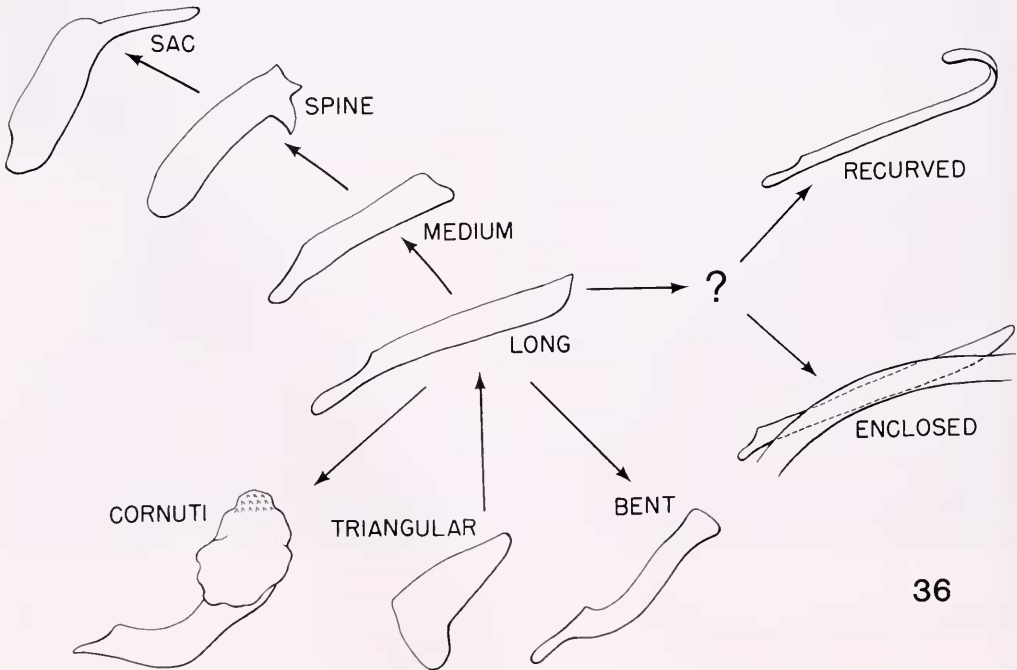
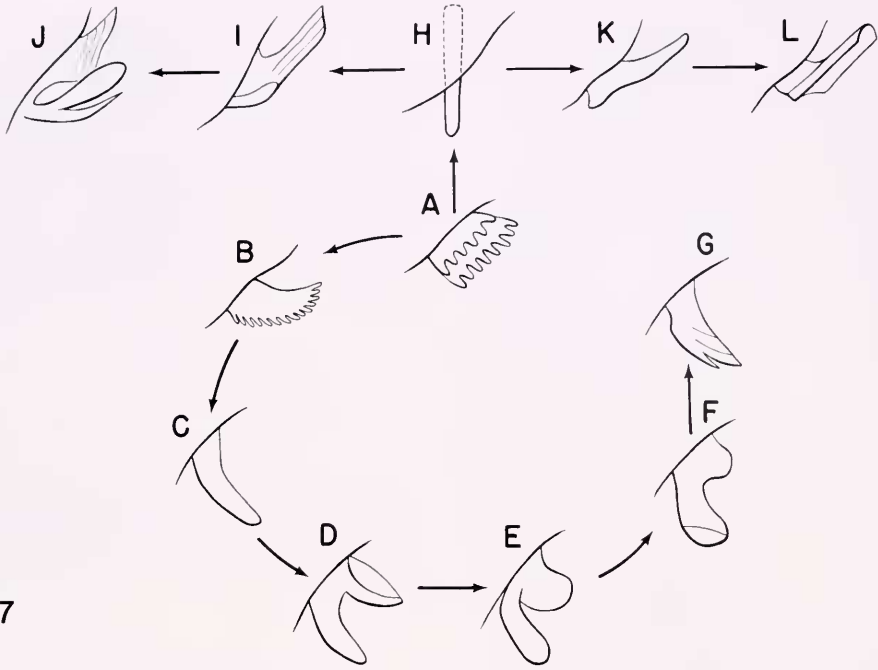
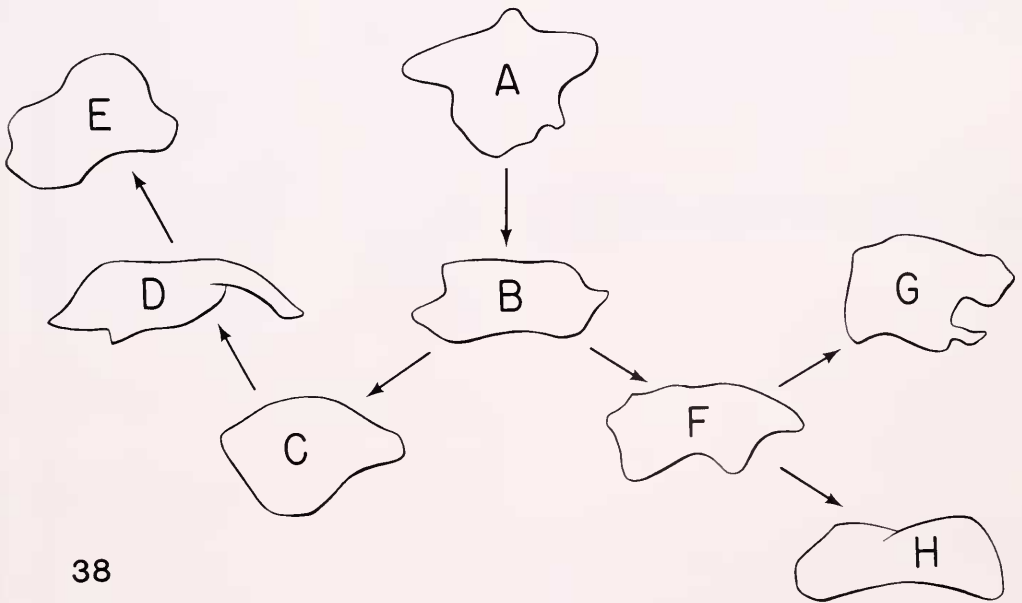


Figure 36. Hypothesized transformation series for aedoeagus shape, illustrated as lateral outlines, with exterior ends toward upper right.



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Figure 37. Hypothesized transformation series for gnathos shape, illustrated as lateral views with ventral edge of tegumen-sociuncus complex on upper left.



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Figure 38. Hypothesized transformation series for sociuncus-tegumen complex, illustrated as lateral outline, with posterior end at right.



Figure 39. Cladogram of genera of Dalceridae (except *Zikan-yrops*). Closed squares are derived states; open squares are primitive states. Outgroup (*Epipyropidae*) is primitive for all states.

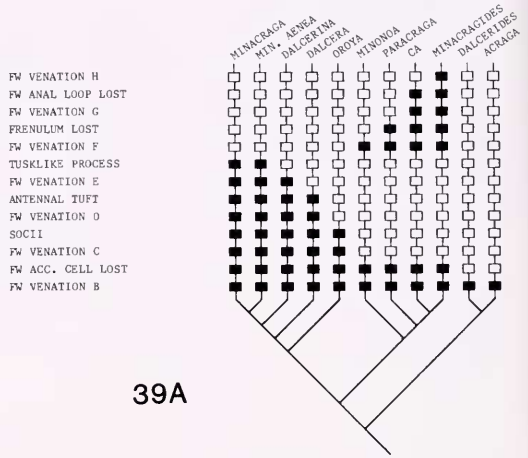


Figure 39A. Cladogram of genera of Dalceridae, generated with data set for Figure 39, but simplified by removal of multistate genital characters. See text for further explanation. Tusklike processes were not in data set, but are included here for clarity.

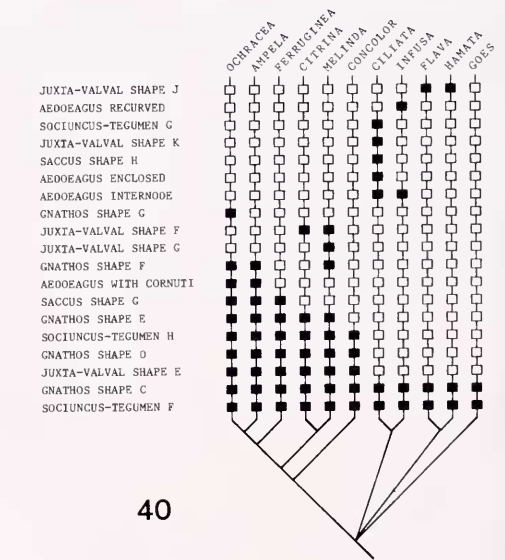
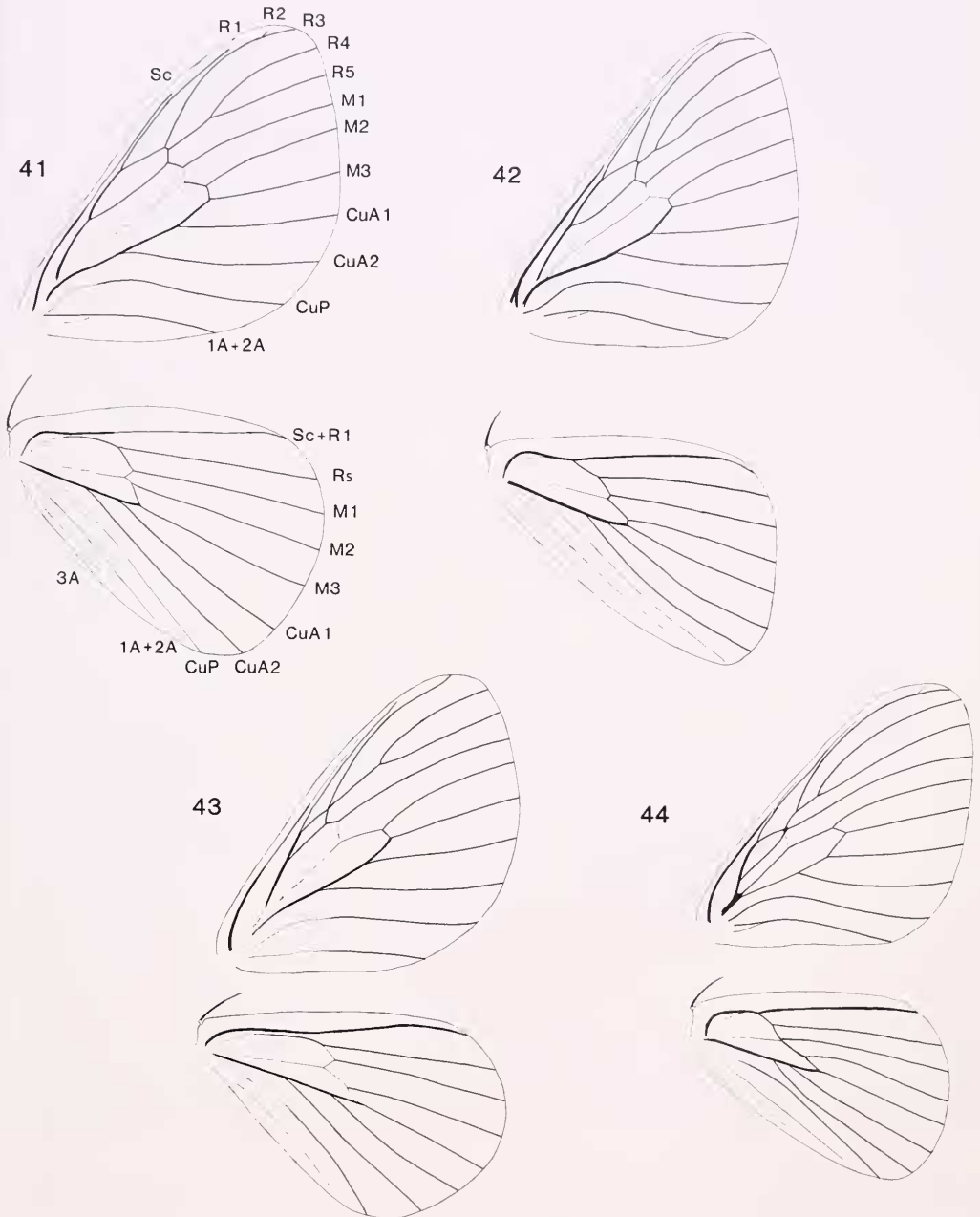
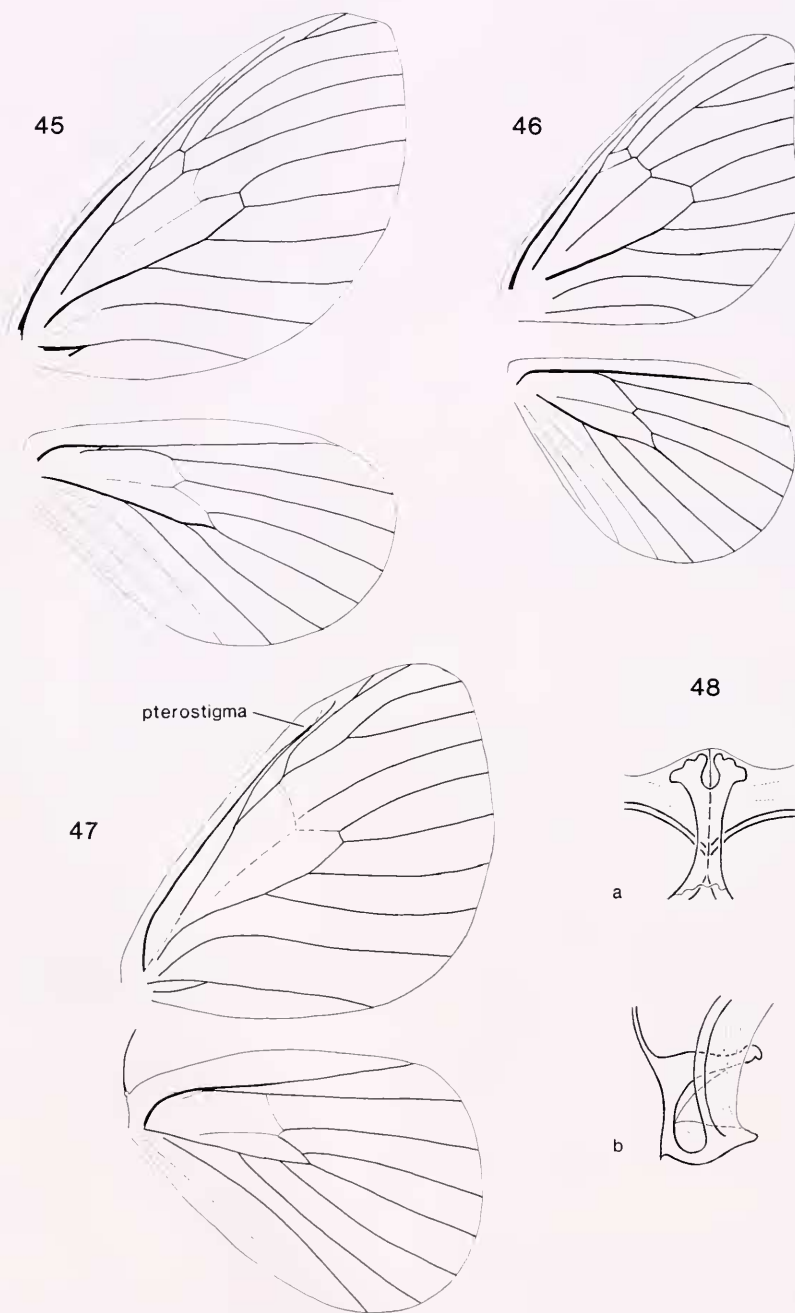


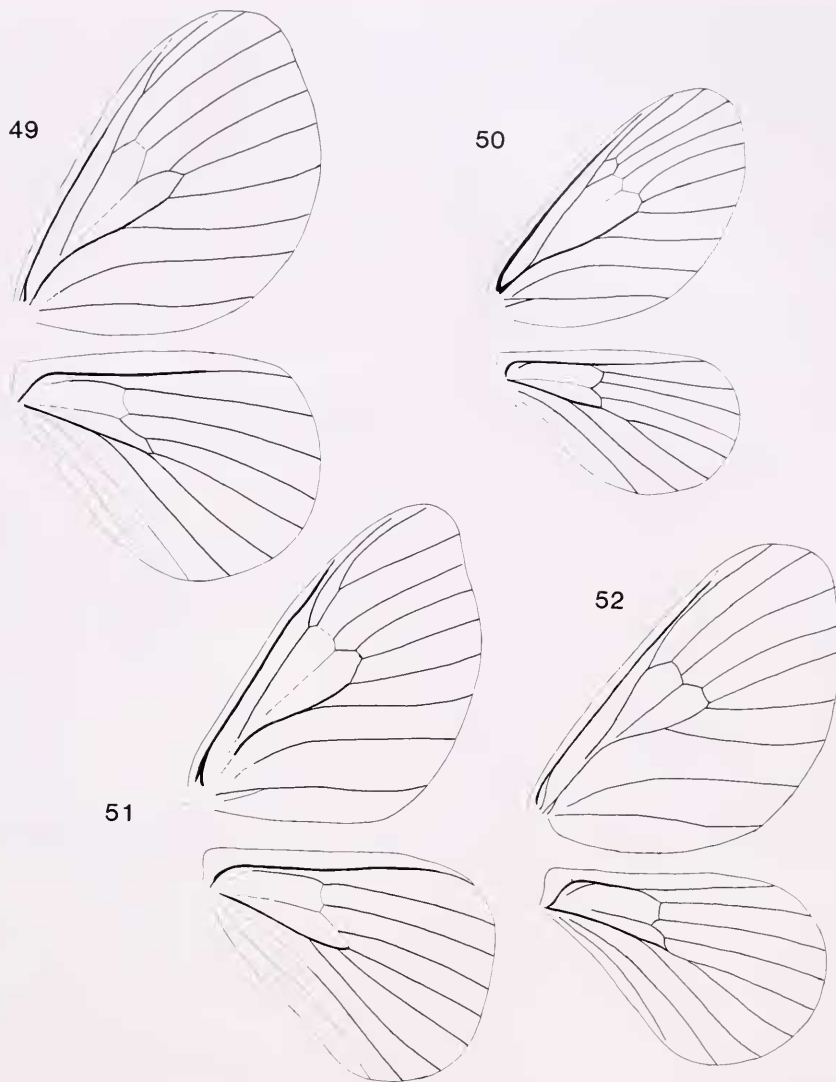
Figure 40. Cladogram of species groups of *Acraga*. Closed squares are derived states; open squares are primitive states.



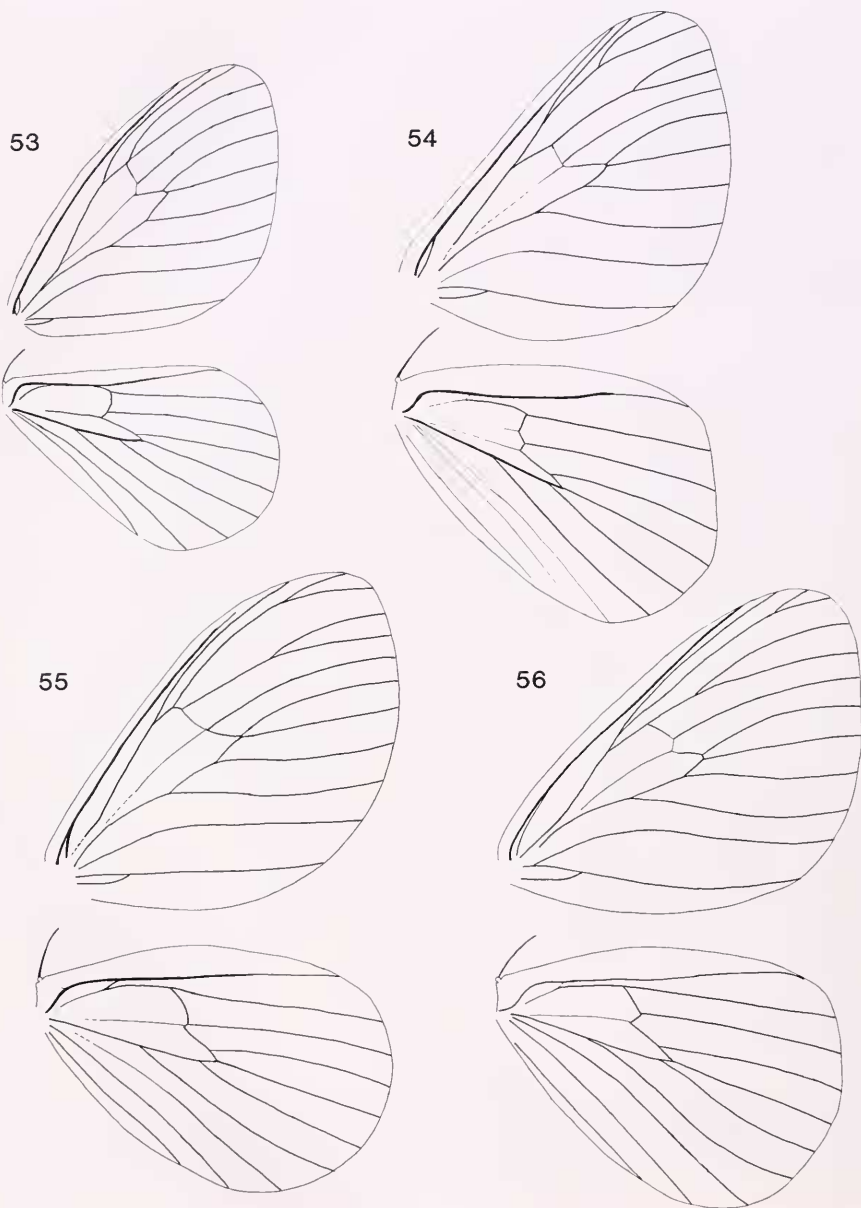
Figures 41–44. Wing venation. Figure 41. *Acraga ciliata*, male (USNM 22541). Figure 42. *Acraga citrina*, male (USNM 22552). Figure 43. *Dalcerides ingenua*, male (USNM 22551). Figure 44. *Dalcerides flavetta*, male (USNM 22542).



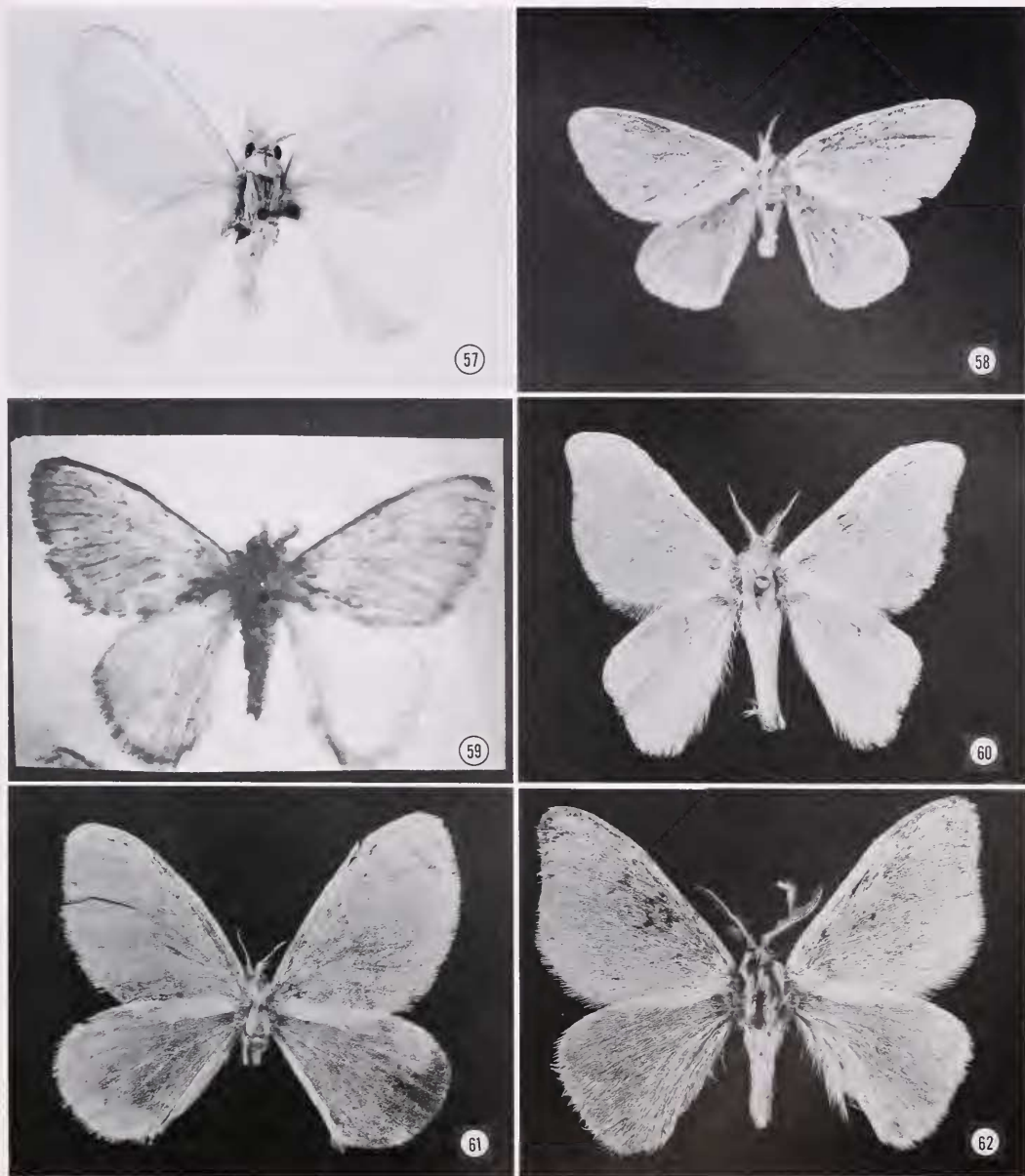
Figures 45–48. Figure 45. *Acraga ferruginea* wing venation, female (IOC 85-52). Figure 46. *Zikanyrops dubiosa* wing venation, female (drawn from holotype, without slide mounting; R_{2+3} might branch at the tip). Figure 47. *Oroya aurora* wing venation, male (BMNH 85-11). Figure 48. *Dalcerides ingenita*, male metathoracic furca, dorsal (top) and lateral (bottom) views (USNM 22556).



Figures 49–52. Wing venation. Figure 49. *Minacragides arnaxis*, male (USNM 22602). Figure 50. *Minacragides* (?) new species B, female (USNM 28101). Figure 51. *Paracraga innocens*, male (USNM 22553). Figure 52. *Ca anastigma*, male (USNM 22592).



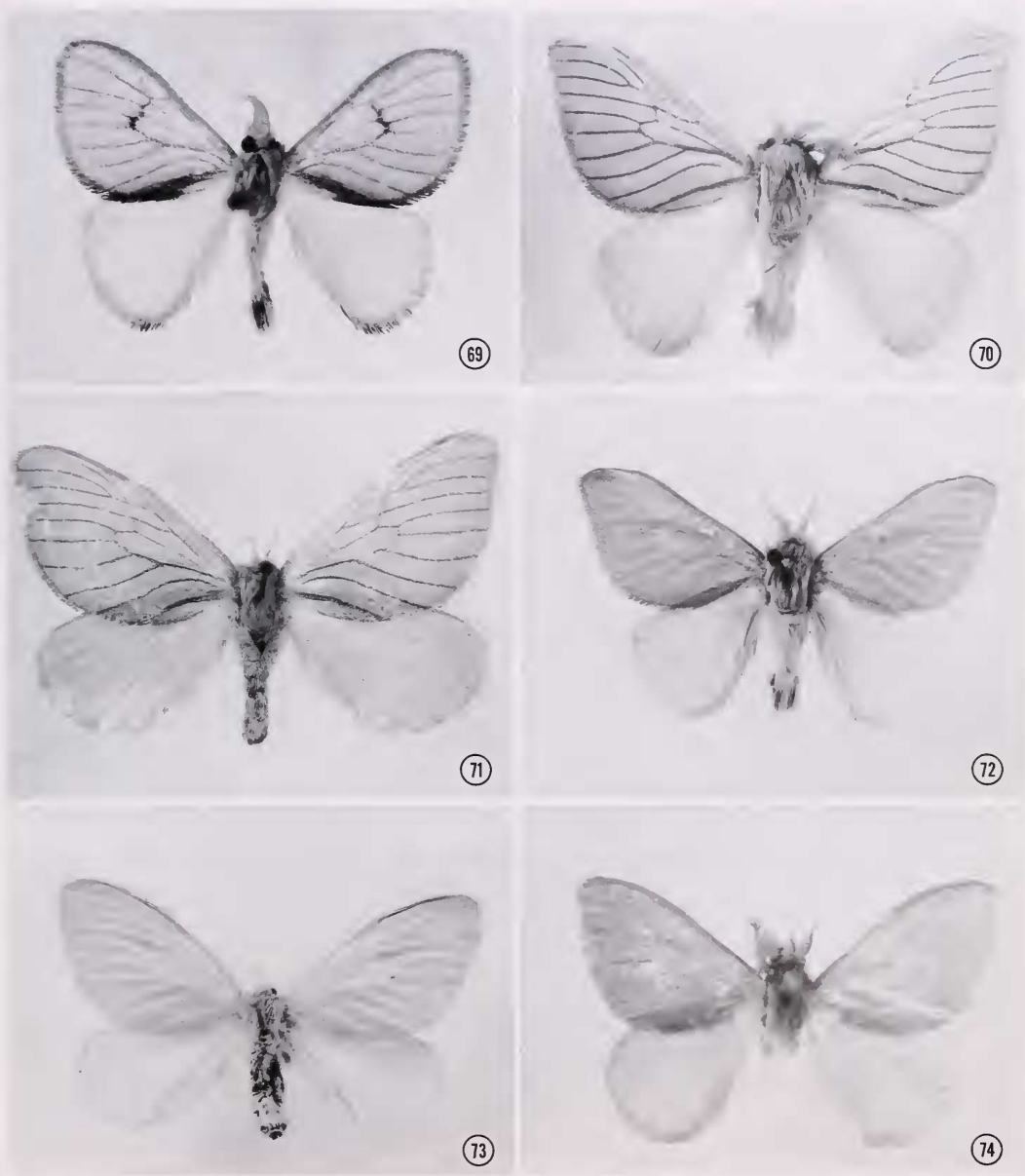
Figures 53–56. Wing venation. Figure 53. *Minonoa elvira*, male (USNM 22554). Figure 54. *Minacraga disconitens*, male (USNM 22548). Figure 55. *Dalcera abrasa*, male (USNM 22546). Figure 56. *Dalcerina tijucana*, male (USNM 22550).



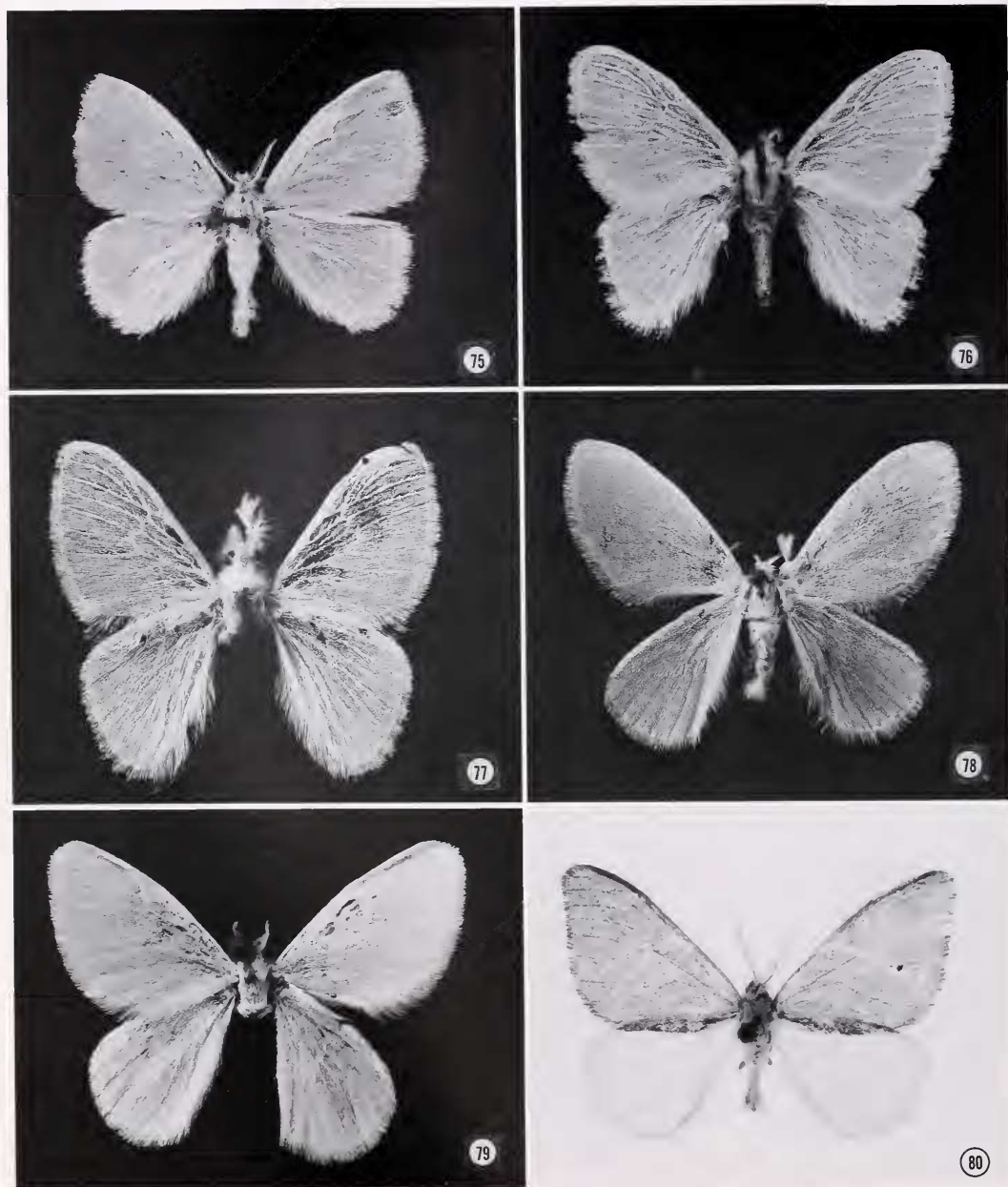
Figures 57–62. Wing patterns. Figure 57. *Acraga goes*, male lectotype, Costa Rica (USNM). Figure 58. *Acraga ingenesens*, female holotype, Venezuela (USNM)—wings very worn. Figure 59. *Acraga luteola*, male holotype, Brazil—copied from old photograph in Hopp Collection (ZSBS). Figure 60. *Acraga hamata*, male lectotype, Costa Rica (USNM). Figure 61. *Acraga hamata*, female, Costa Rica (BMNH). Figure 62. *Acraga andina*, male paratype, Peru (BMNH).



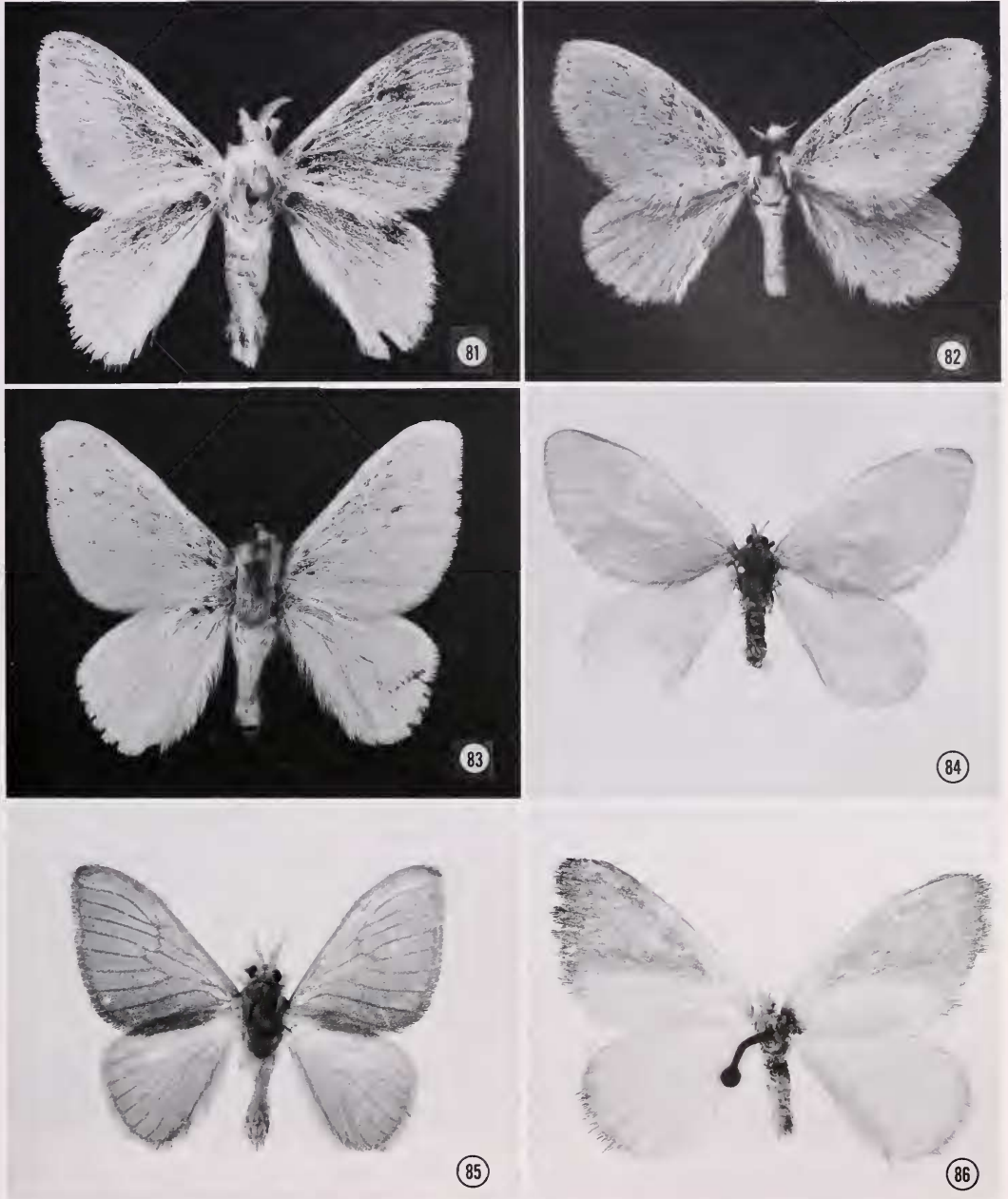
Figures 63–68. Wing patterns. Figure 63. *Acraga flava*, male, Brazil (USNM). Figure 64. *Acraga flava*, female, Brazil (USNM). Figure 65. *Acraga obscura*, male, Brazil (VOB). Figure 66. *Acraga neblina*, male holotype, Venezuela (USNM). Figure 67. *Acraga infusa*, male holotype, French Guiana (USNM). Figure 68. *Acraga philetera*, male syntype, Costa Rica (USNM).



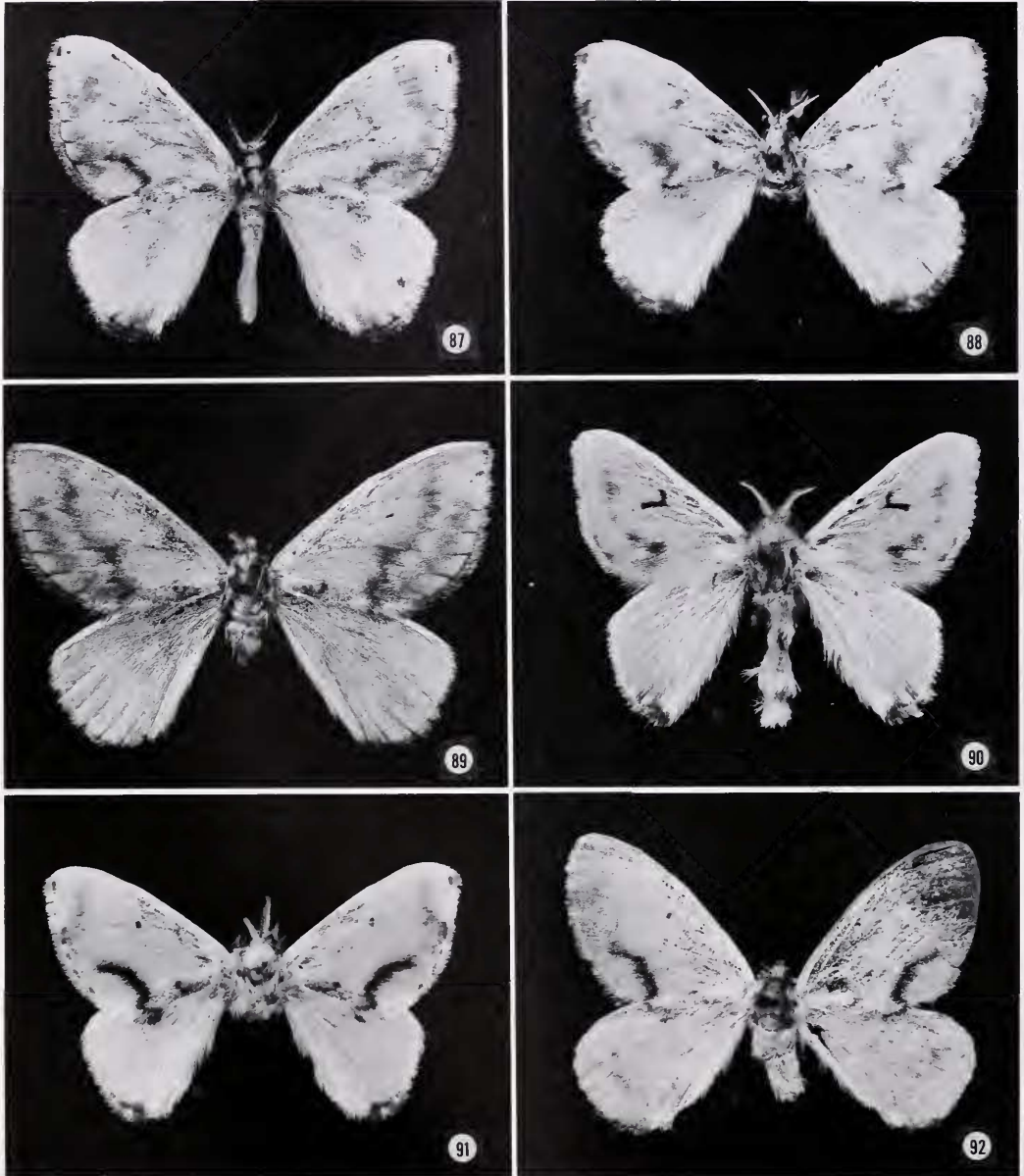
Figures 69–74. Wing patterns. Figure 69. *Acraga ciliata*, male, Jamaica (USNM). Figure 70. *Acraga moorei*, male, Venezuela (USNM). Figure 71. *Acraga moorei*, female, Bolivia (USNM). Figure 72. *Acraga coa*, male (lectotype of *A. moribunda*), Guatemala (USNM). Figure 73. *Acraga coa*, female paralectotype, Mexico (USNM). Figure 74. *Acraga chicana*, male holotype, Mexico (AMNH)—white areas on forewings are due to scale loss.



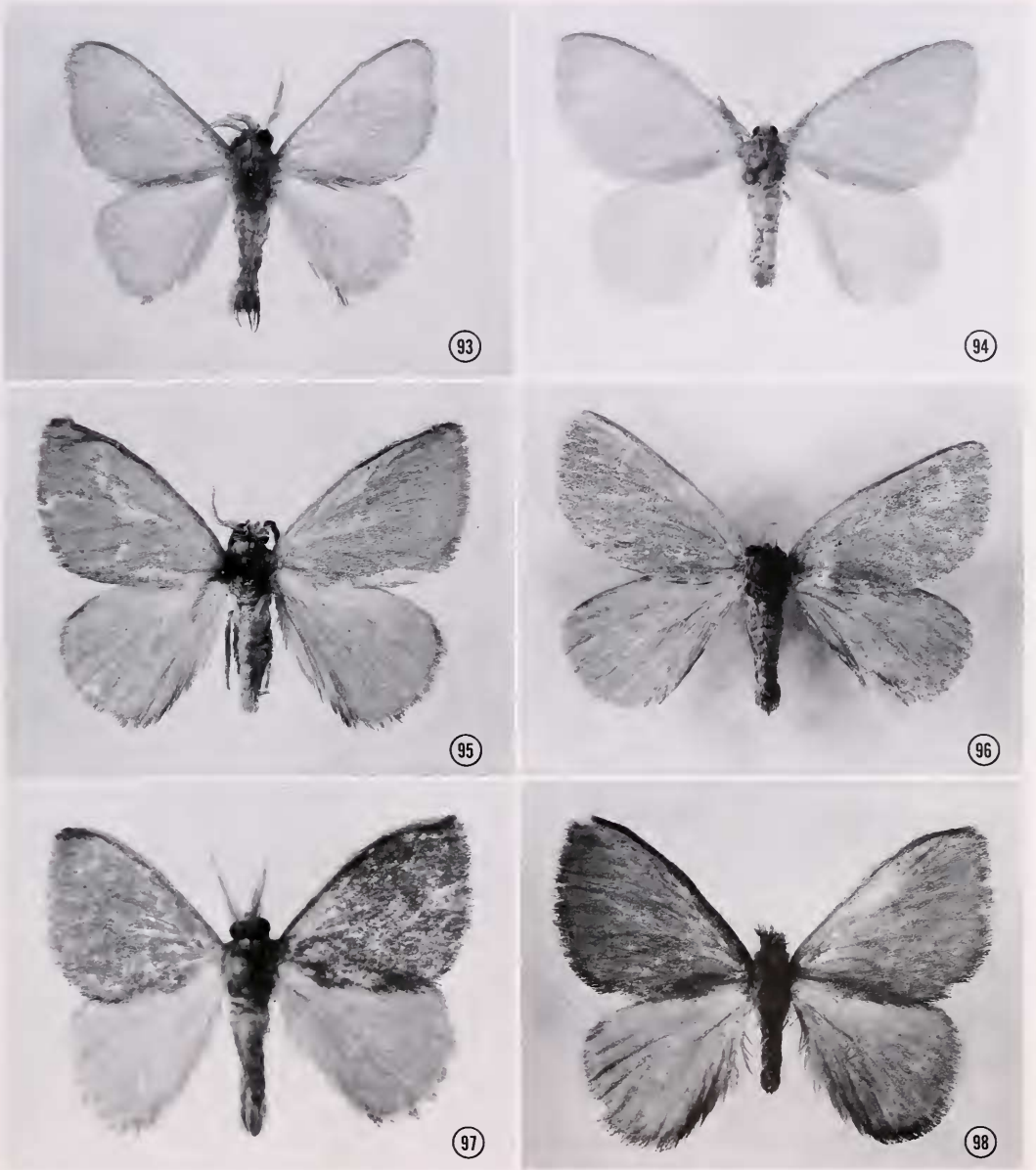
Figures 75–80. Wing patterns. Figure 75. *Acraga ria*, male, Brazil (BMNH). Figure 76. *Acraga concolor*, male, Brazil (BMNH). Figure 77. *Acraga citrinopsis*, male, Brazil (LACM). Figure 78. *Acraga citrinopsis*, female, Brazil (USNM). Figure 79. *Acraga beebei*, male holotype, Venezuela (USNM). Figure 80. *Acraga perbrunnea*, male, Colombia (USNM).



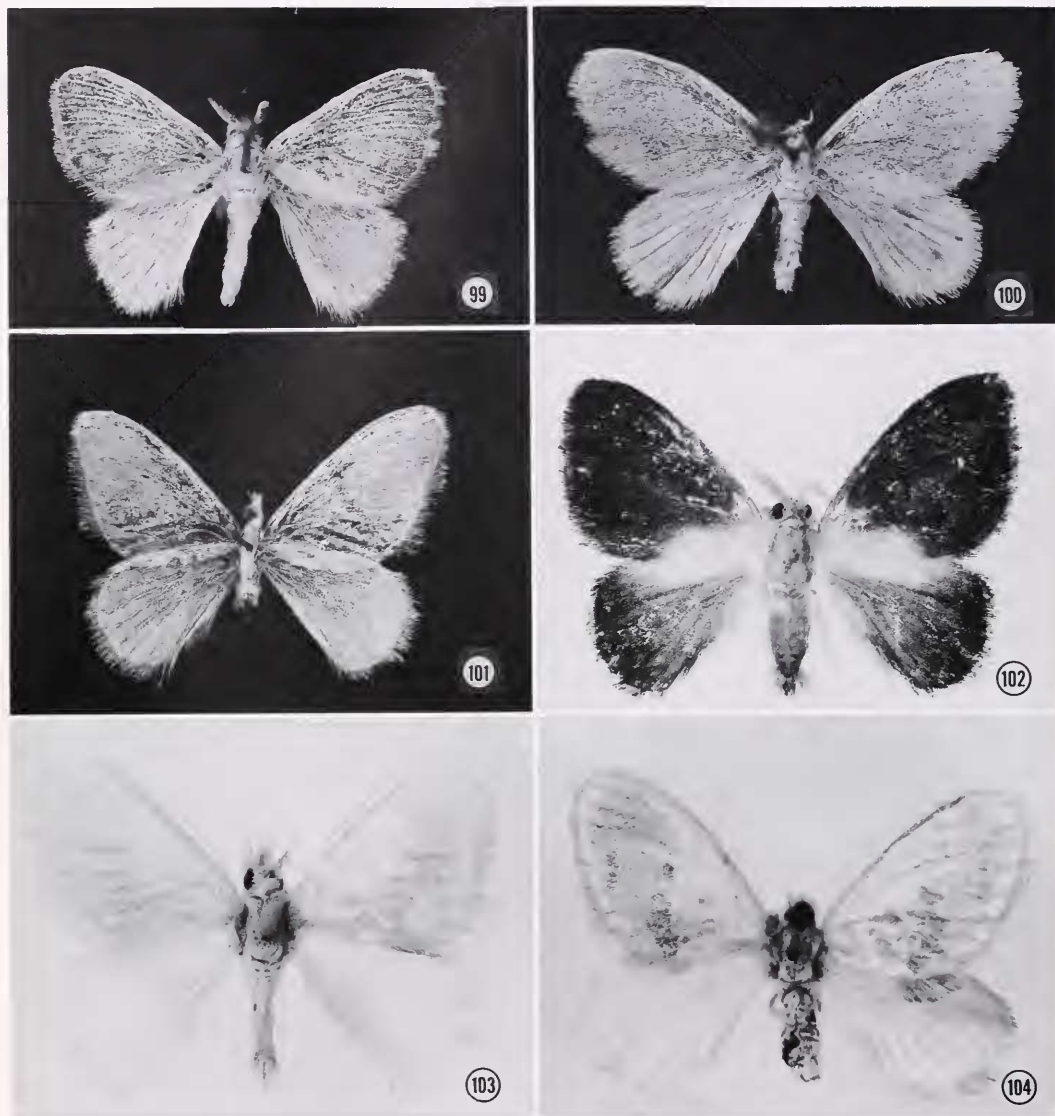
Figures 81–86. Wing patterns. Figure 81. *Acraga citrina*, male holotype, Trinidad (USNM). Figure 82. *Acraga citrina*, female, Brazil (USNM). Figure 83. *Acraga melinda*, male, Panama (AMNH). Figure 84. *Acraga melinda*, female holotype, Panama (ZMHB). Figure 85. *Acraga meridensis*, male, Colombia (USNM). Figure 86. *Zikanyrops dubiosa*, female holotype, Bolivia (ZMHB).



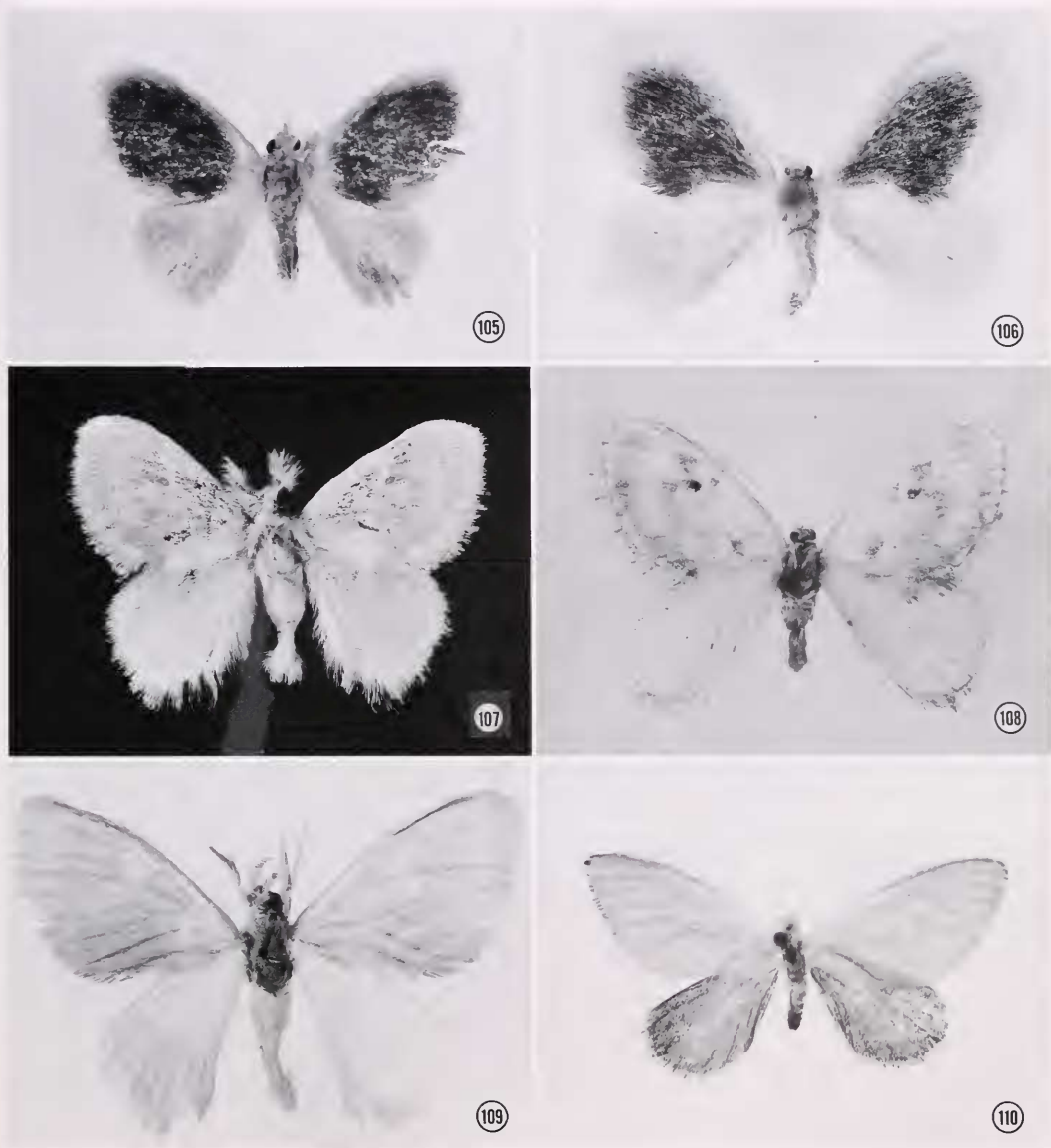
Figures 87–92. Wing patterns. Figure 87. *Acraga ampela*, male, Colombia (USNM). Figure 88. *Acraga puno*, male paratype, Peru (USNM). Figure 89. *Acraga boliviana*, male, Brazil (BMNH). Figure 90. *Acraga angulifera*, male, French Guiana (USNM). Figure 91. *Acraga leberna*, male (lectotype of *A. arcifera*), French Guiana (USNM). Figure 92. *Acraga leberna*, female, Guyana (USNM).



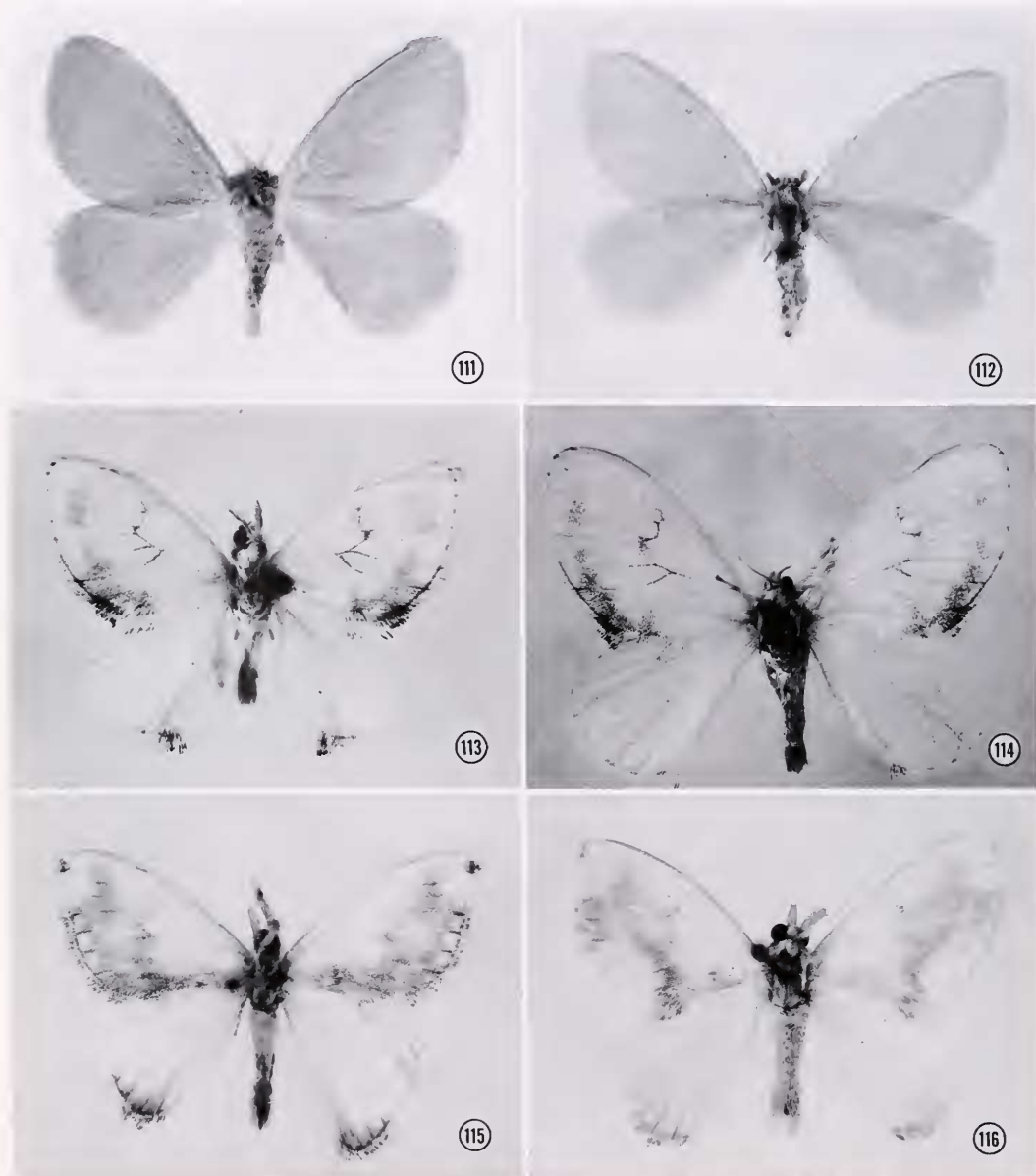
Figures 93–98. Wing patterns. Figure 93. *Acraga ochracea*, male, Brazil (USNM). Figure 94. *Acraga ochracea*, female, Brazil (IOC). Figure 95. *Acraga sexquicentaria*, male, Brazil (CMNH). Figure 96. *Acraga sexquicentaria*, female, Brazil (MCZ). Figure 97. *Acraga victoria*, male holotype, Brazil (MNRJ). Figure 98. *Acraga parana*, male paratype, Brazil (BMNH).



Figures 99–104. Wing patterns. Figure 99. *Dalcerides flavetta*, male, Bolivia (USNM). Figure 100. *Dalcerides flavetta*, female, Bolivia (USNM). Figure 101. *Dalcerides* new species, male, Costa Rica (BMNH). Figure 102. *Dalcerides dulciola*, male, Costa Rica (USNM). Figure 103. *Dalcerides radians*, male holotype, Brazil (ZMHB). Figure 104. *Dalcerides radians*, female, Brazil (VOB).



Figures 105–110. Wing patterns. Figure 105. *Dalcerides mesoa*, male, Costa Rica (USNM). Figure 106. *Dalcerides mesoa*, female, Costa Rica (USNM). Figure 107. *Dalcerides sofia*, male, Costa Rica (USNM). Figure 108. *Dalcerides sofia*, female holotype, Mexico (USNM). Figure 109. *Dalcerides nana*, male, Brazil (CU). Figure 110. *Dalcerides bicolor*, female holotype, Costa Rica (USNM).



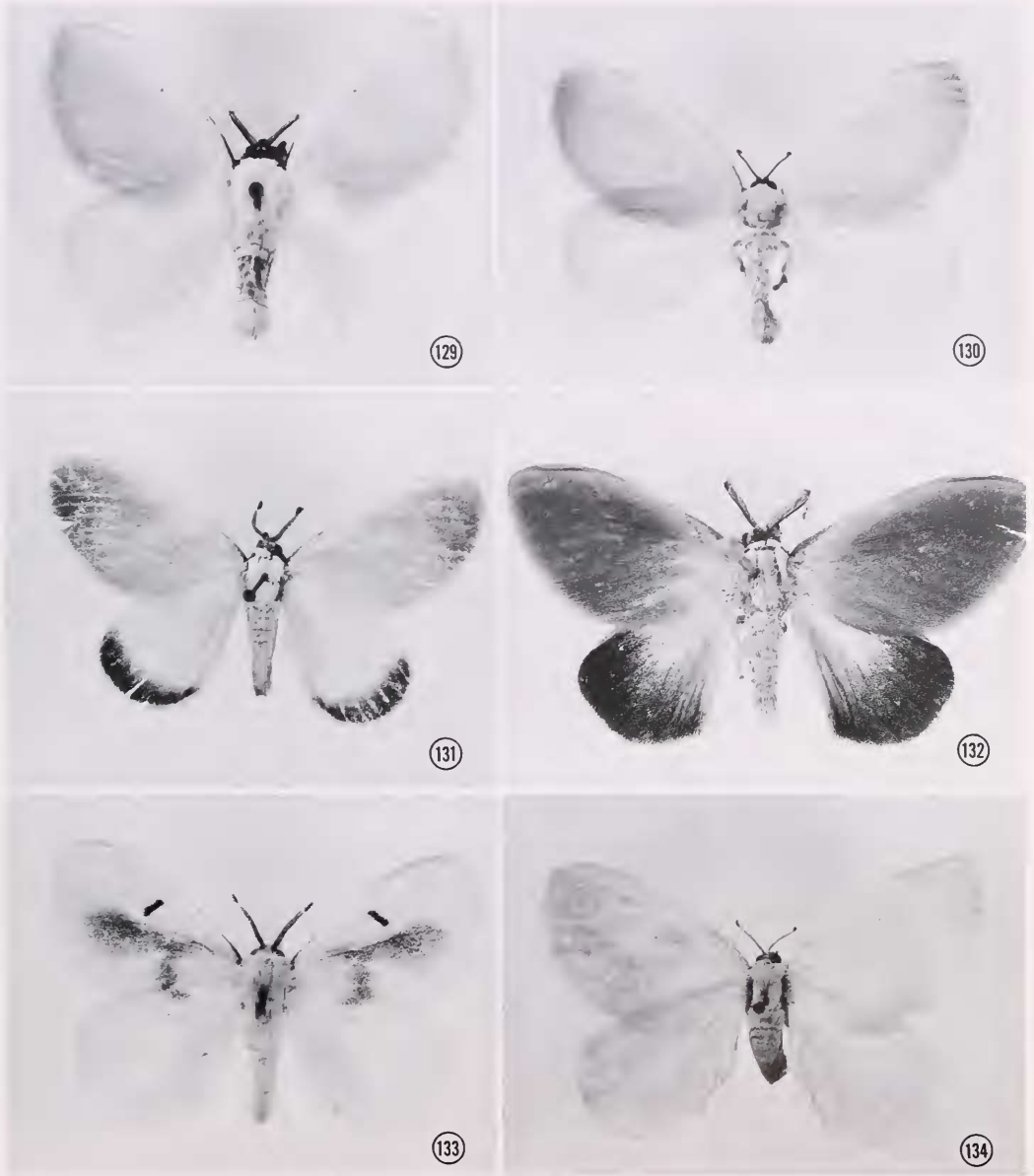
Figures 111–116. Wing patterns. Figure 111. *Dalcerides ingenua*, male, Arizona (USNM). Figure 112. *Dalcerides ingenua*, female, Arizona (USNM). Figure 113. *Dalcerides alba*, male, Guatemala (USNM). Figure 114. *Dalcerides alba*, female (paralectotype of *D. caretta*), Mexico (USNM). Figure 115. *Acraga isothea*, male lectotype, Panama (USNM). Figure 116. *Acraga umbrifera*, male holotype, French Guiana (USNM).



Figures 117–122. Wing patterns. Figure 117. *Paracraga innocens*, male holotype, French Guiana (USNM). Figure 118. *Paracraga innocens*, female, French Guiana (USNM). Figure 119. *Paracraga amianta*, male holotype, Guyana (USNM). Figure 120. *Paracraga argentea*, male, Mexico (AMNH). Figure 121. *Paracraga canalicula*, male, Peru (USNM). Figure 122. *Paracraga halophora*, male, Peru (USNM).



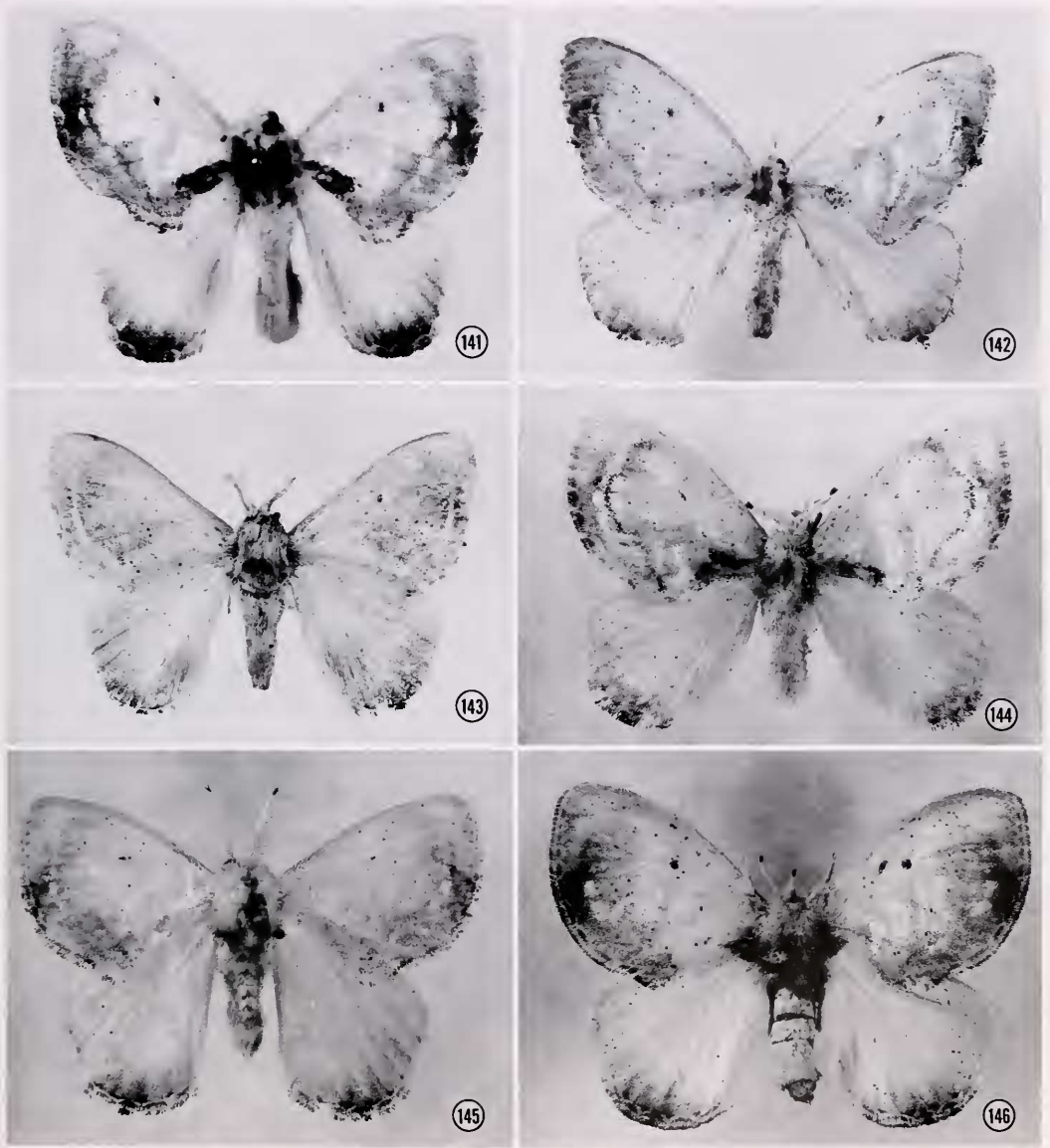
Figures 123–128. Wing patterns. Figure 123. *Paracraga necoda*, male paralectotype, Colombia (USNM). Figure 124. *Paracraga pulverina*, male holotype, Guatemala (USNM). Figure 125. *Minonoa elvira*, male lectotype, Colombia (USNM). Figure 126. *Minonoa elvira*, female paralectotype, Colombia (USNM). Figure 127. *Minonoa pachitea*, female holotype, Peru (ZSBS). Figure 128. *Minonoa perbella*, female (holotype of *M. variegata*), Brazil (BMNH).



Figures 129–134. Wing patterns. Figure 129. *Dalcera abrasa*, male, Brazil (LACM). Figure 130. *Dalcera abrasa*, female, Brazil (VOB). Figure 131. *Dalcera canescens*, male (lectotype of *D. consanguinea*), Brazil (USNM). Figure 132. *Dalcera semirufa*, male paralectotype, Colombia (BMNH). Figure 133. *Dalcerina tijucana*, male (lectotype of *D. fumata*), Brazil (USNM). Figure 134. *Dalcerina tijucana*, female (holotype of *D. dierryheoa*), Paraguay (USNM).



Figures 135–140. Wing patterns. Figure 135. *Minacragides arnaxis*, male, Colombia (USNM). Figure 136. *Minacragides* new species A, male, Brazil (IOC)—lines on wings are due to loss of scales. Figure 137. *Minacragides* (?) new species B, male, Brazil (VOB). Figure 138. *Ca anastigma*, male paralectotype, Panama (USNM). Figure 139. *Minacraga aenea*, male holotype, Brazil (ZSBS). Figure 140. *Minacraga hyalina*, male holotype, Peru (BMNH).



Figures 141–146. Wing patterns. Figure 141. *Minacraga disconitens*, male lectotype, French Guiana (USNM). Figure 142. *Minacraga disconitens*, female, French Guiana (USNM). Figure 143. *Minacraga indiscata*, male paralectotype, French Guiana (USNM). Figure 144. *Minacraga argentata*, male holotype, Brazil (ZSBS). Figure 145. *Minacraga itatiaia*, male, Brazil (BMNH). Figure 146. *Minacraga itatiaia*, female, Brazil (BMNH).



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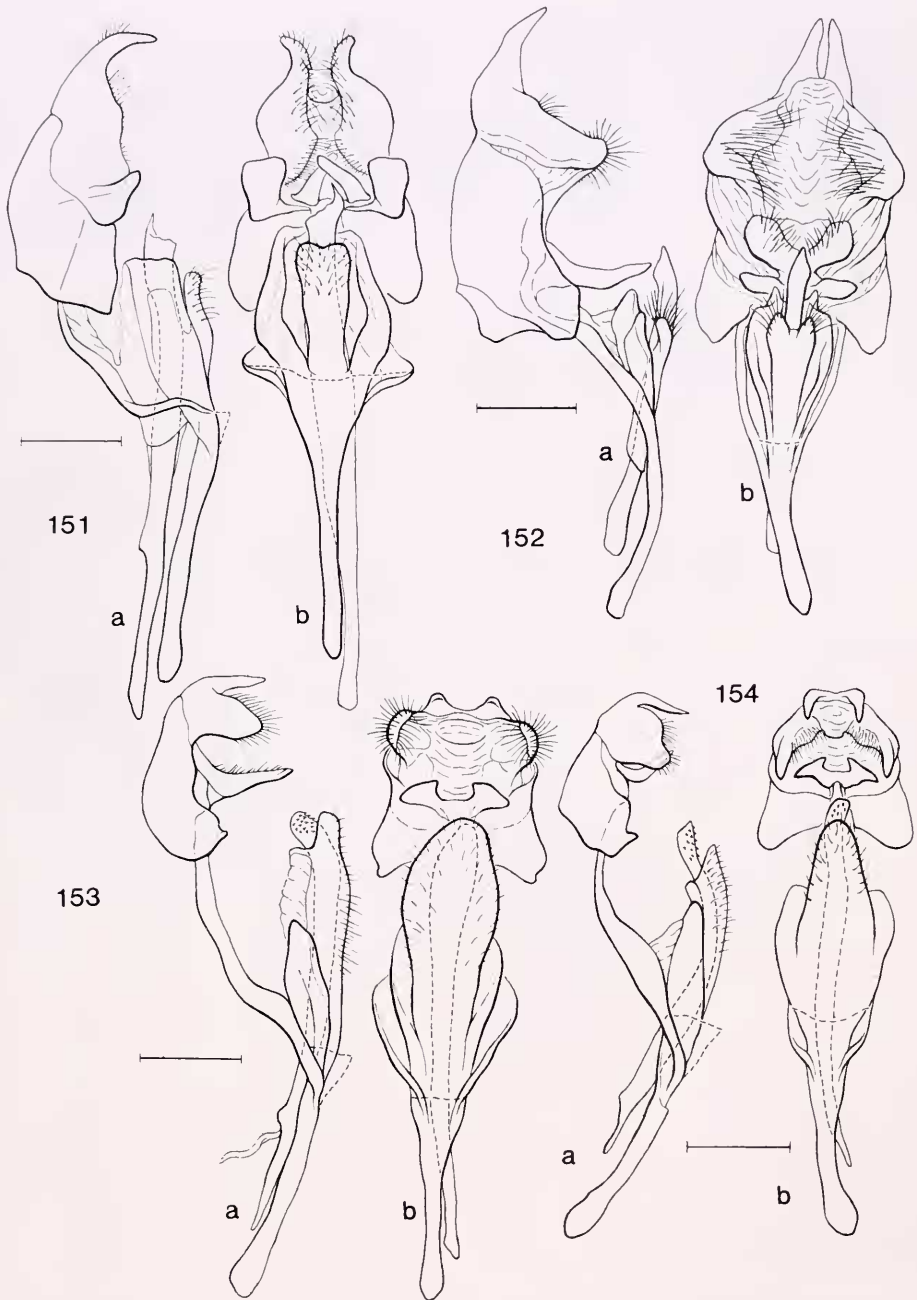


149

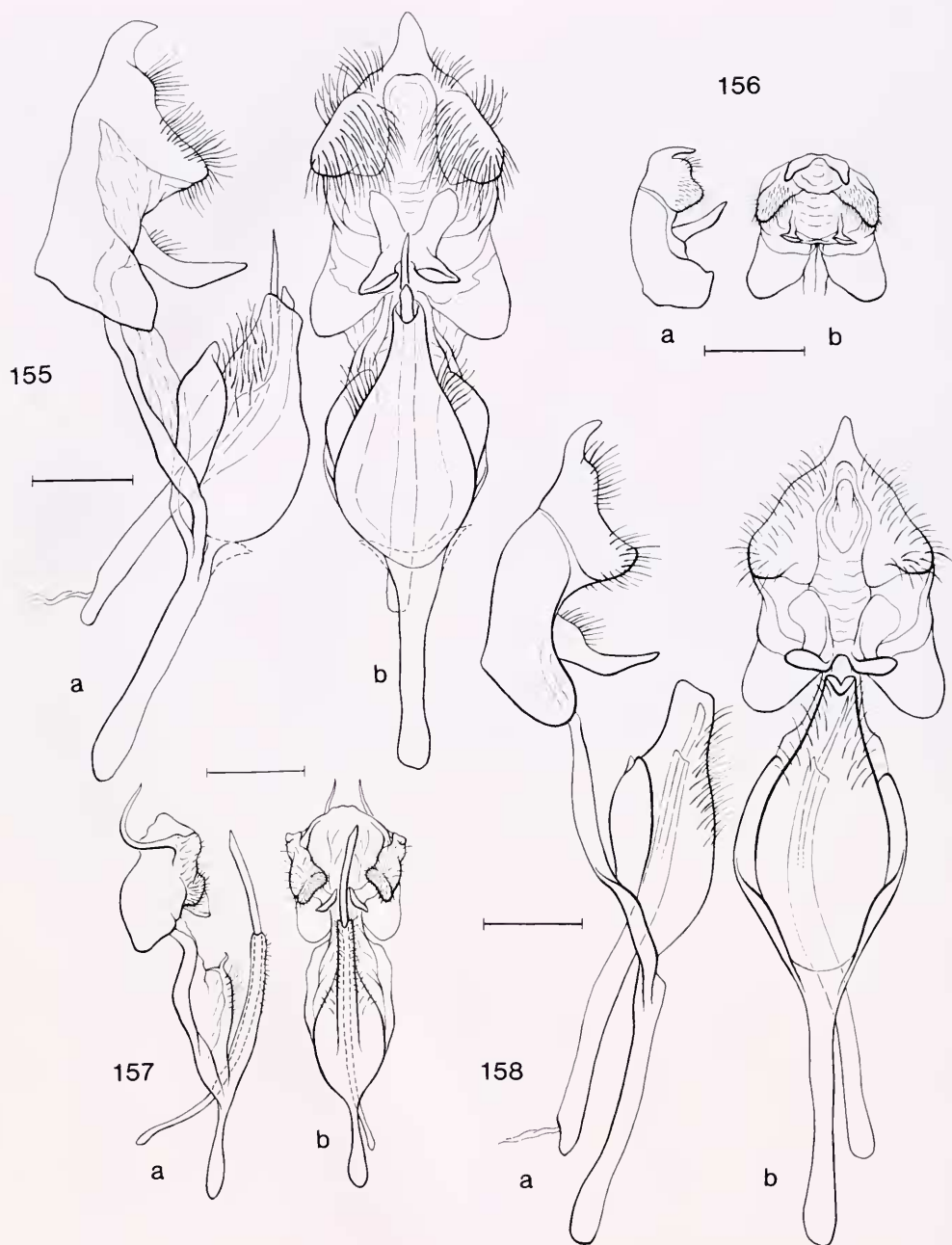


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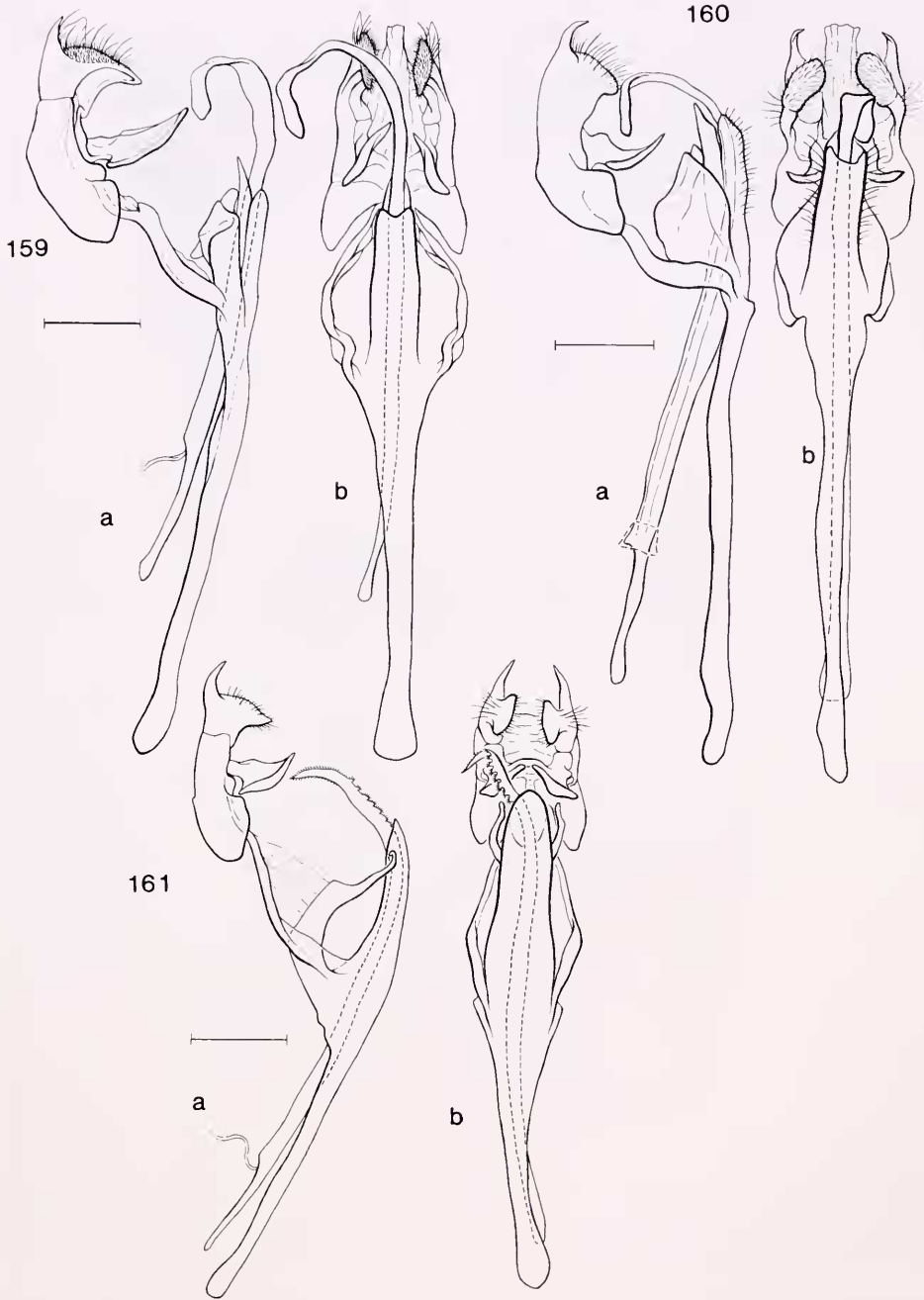
Figures 147–150. Wing patterns. Figure 147. *Acraga ferruginea*, male, Brazil (IOC). Figure 148. *Acraga ferruginea*, female, Brazil (IOC). Figure 149. *Acraga brunnea*, male holotype, Brazil (MNRJ). Figure 150. *Oroya aurora*, male paratype, Peru (BMNH).



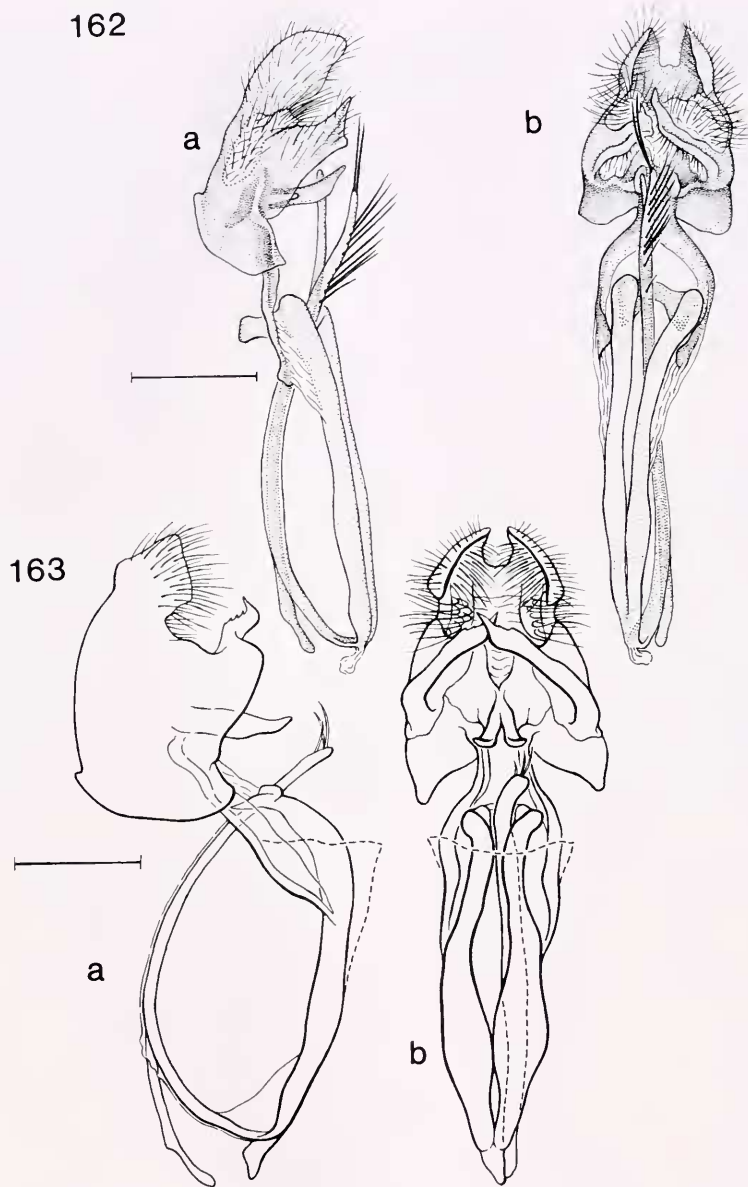
Figures 151–154. Male genitalia of *Acraga*, lateral (a) and ventral (b) views. Figure 151. *Acraga* species F (BMNH 85-5) (scale = 0.5 mm). Figure 152. *Acraga goes* (USNM 22651) (scale = 0.5 mm). Figure 153. *Acraga hamata* (USNM 22614) (scale = 1 mm). Figure 154. *Acraga andina*, holotype (USNM 28080) (scale = 1 mm).



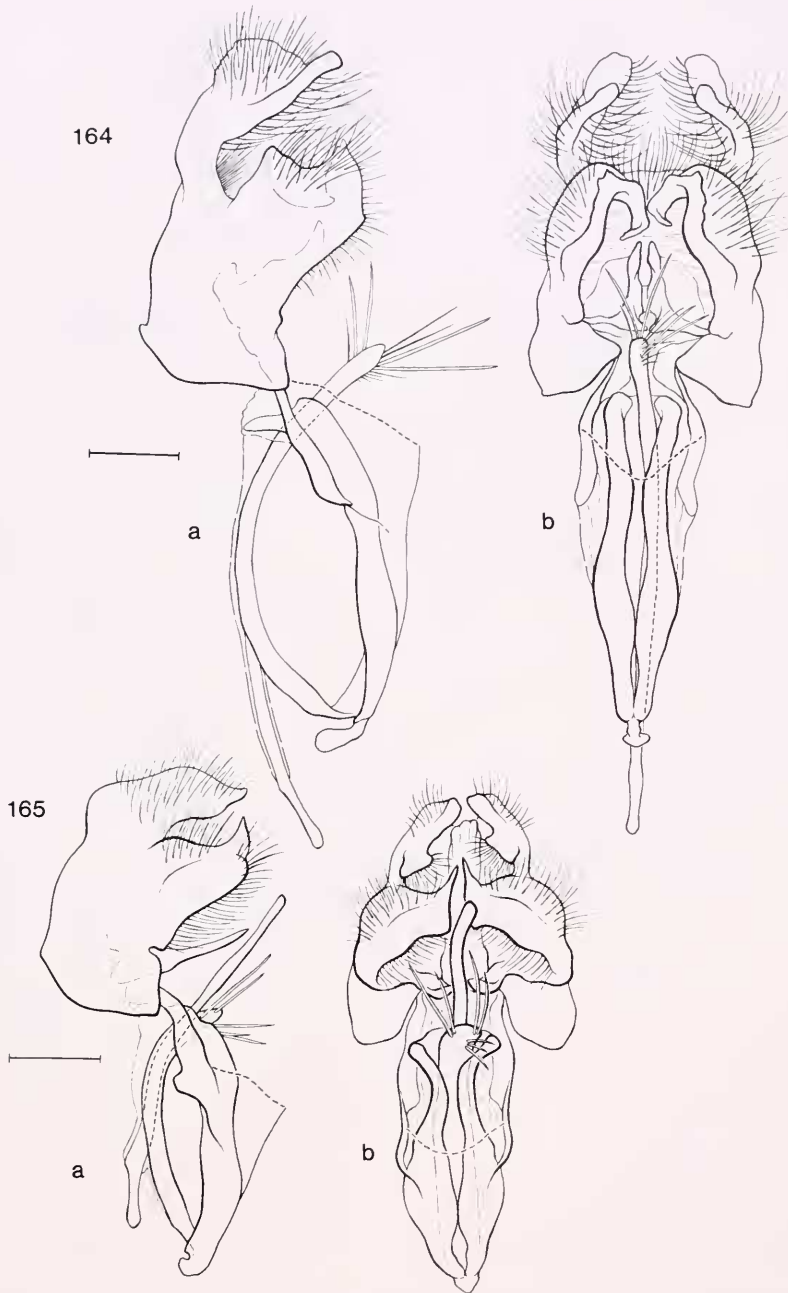
Figures 155–158. Male genitalia of *Acraga*, lateral (a) and ventral (b) views. Figure 155. *Acraga flava* (USNM 22509) (scale = 0.5 mm). Figure 156. *Acraga andina*, Venezuelan variant (UCV 86-23), tegumen–sociuncus complex only (scale = 1 mm). Figure 157. *Acraga ria*, holotype (USNM 22605) (scale = 1 mm). Figure 158. *Acraga obscura*, holotype (USNM 22673) (scale = 0.5 mm).



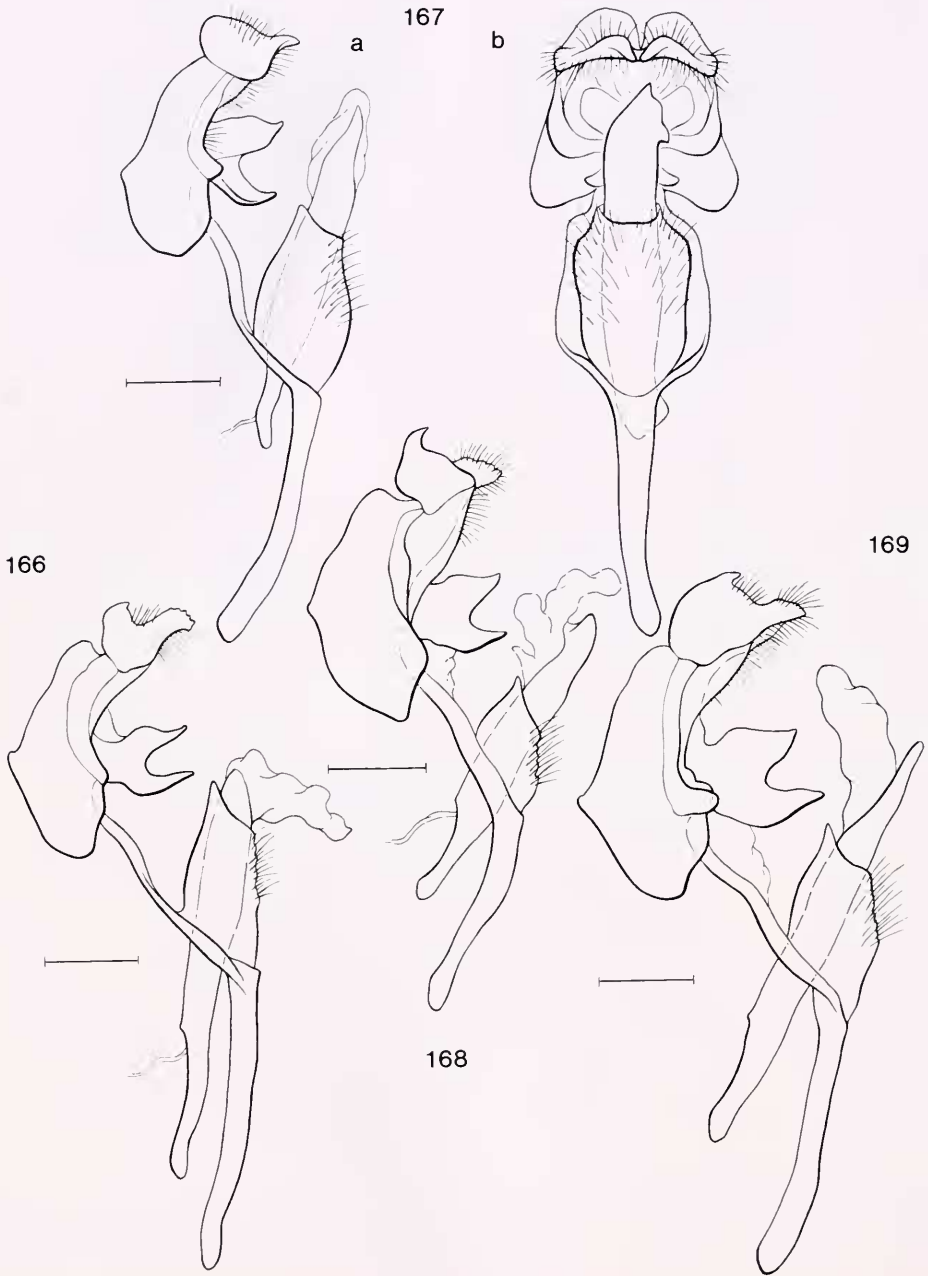
Figures 159–161. Male genitalia of *Acraga*, lateral (a) and ventral (b) views. Figure 159. *Acraga infusa* (USNM 22617) (scale = 0.5 mm). Figure 160. *Acraga neblina*, holotype (USNM 28036) (scale = 1 mm). Figure 161. *Acraga serrata*, holotype (USNM 28073) (scale = 1 mm).



Figures 162, 163. Male genitalia of *Acraga*, lateral (a) and ventral (b) views (scale = 1 mm). Figure 162. *Acraga ciliata* (USNM 22485). Figure 163. *Acraga moorei* (USNM 22615).



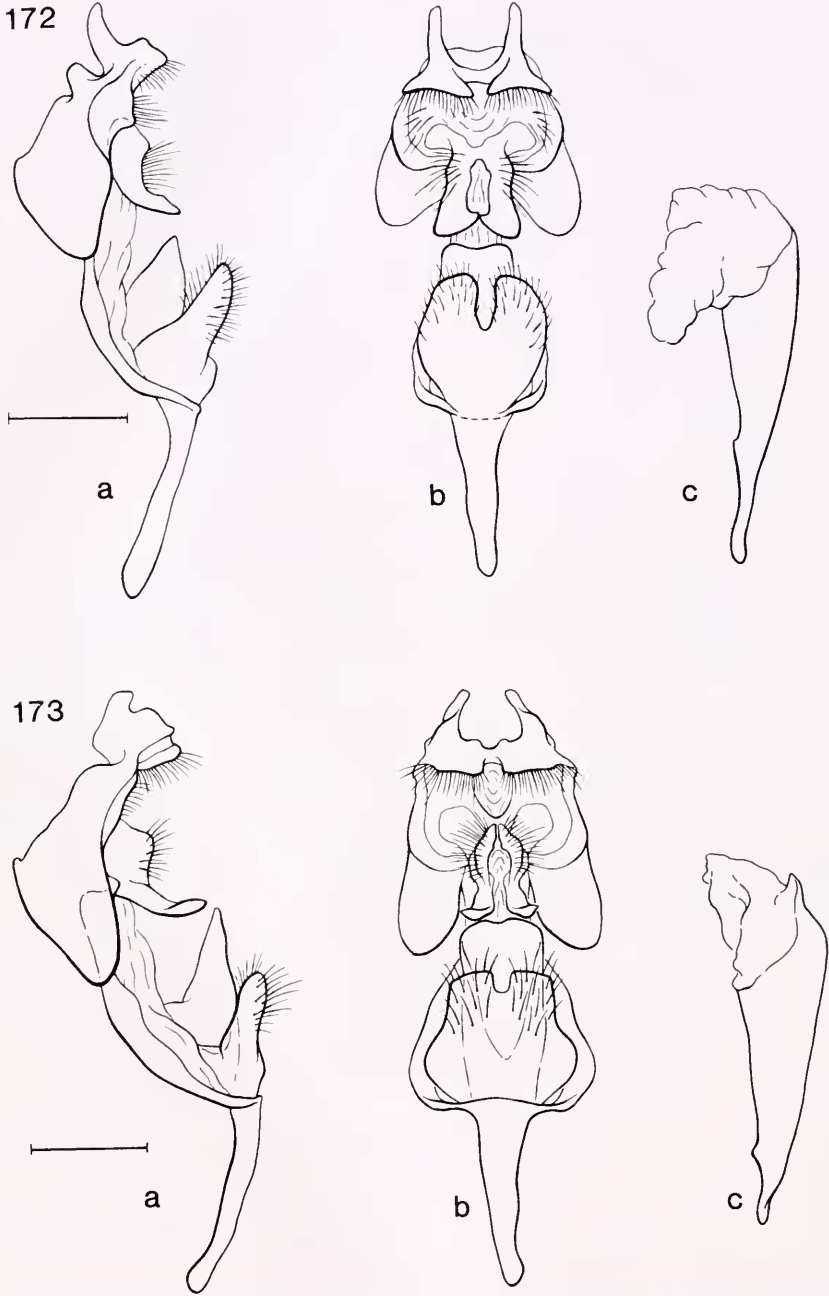
Figures 164, 165. Male genitalia of *Acraga*, lateral (a) and ventral (b) views (scale = 1 mm). Figure 164. *Acraga coa* (USNM 22666). Figure 165. *Acraga chicana*, holotype (AMNH 86-18).



Figures 166–169. Male genitalia of *Acraga* (scale = 0.5 mm). Figure 166. *Acraga* species C (BMNH 85-7), lateral. Figure 167. *Acraga concolor* (BMNH 86-36), lateral (a) and ventral (b). Figure 168. *Acraga beebei*, holotype (USNM 22646), lateral. Figure 169. *Acraga citrinopsis* (BMNH 86-28), lateral.

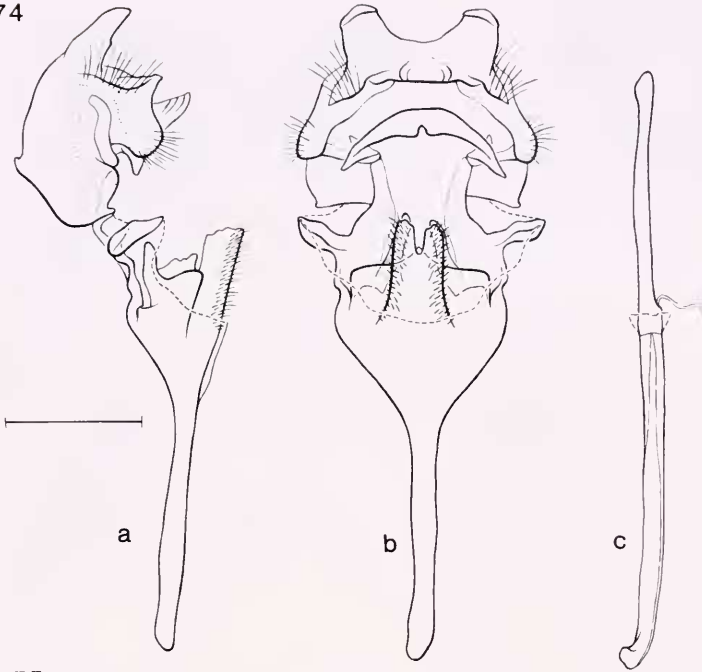


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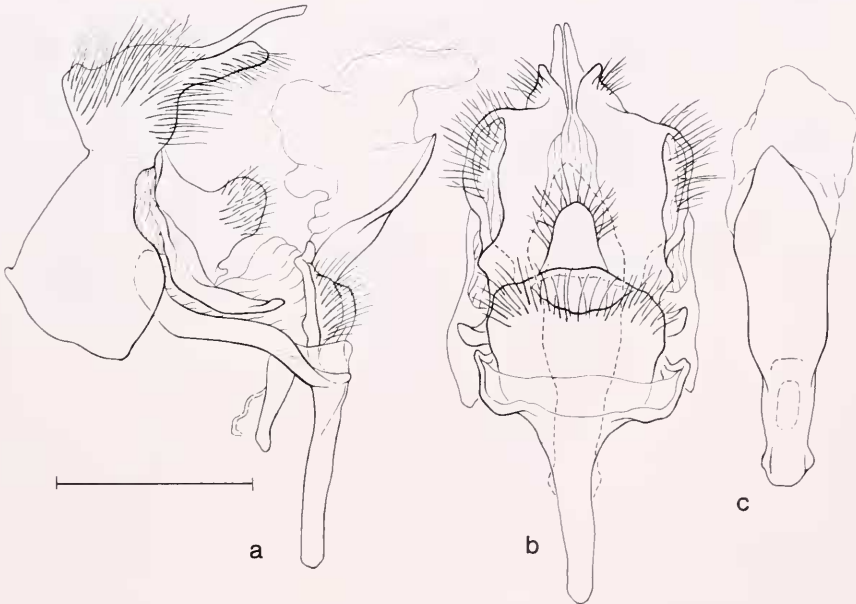


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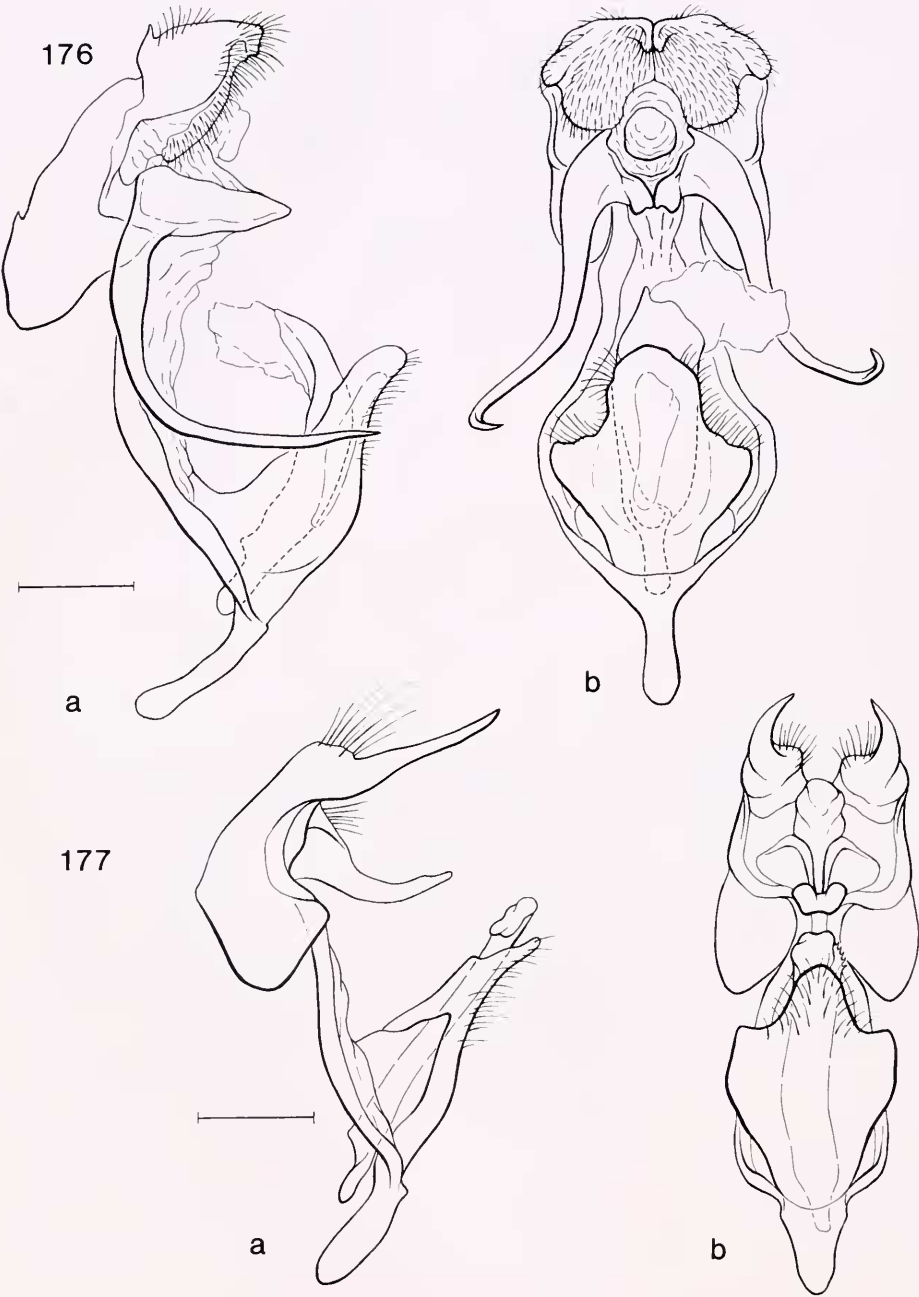
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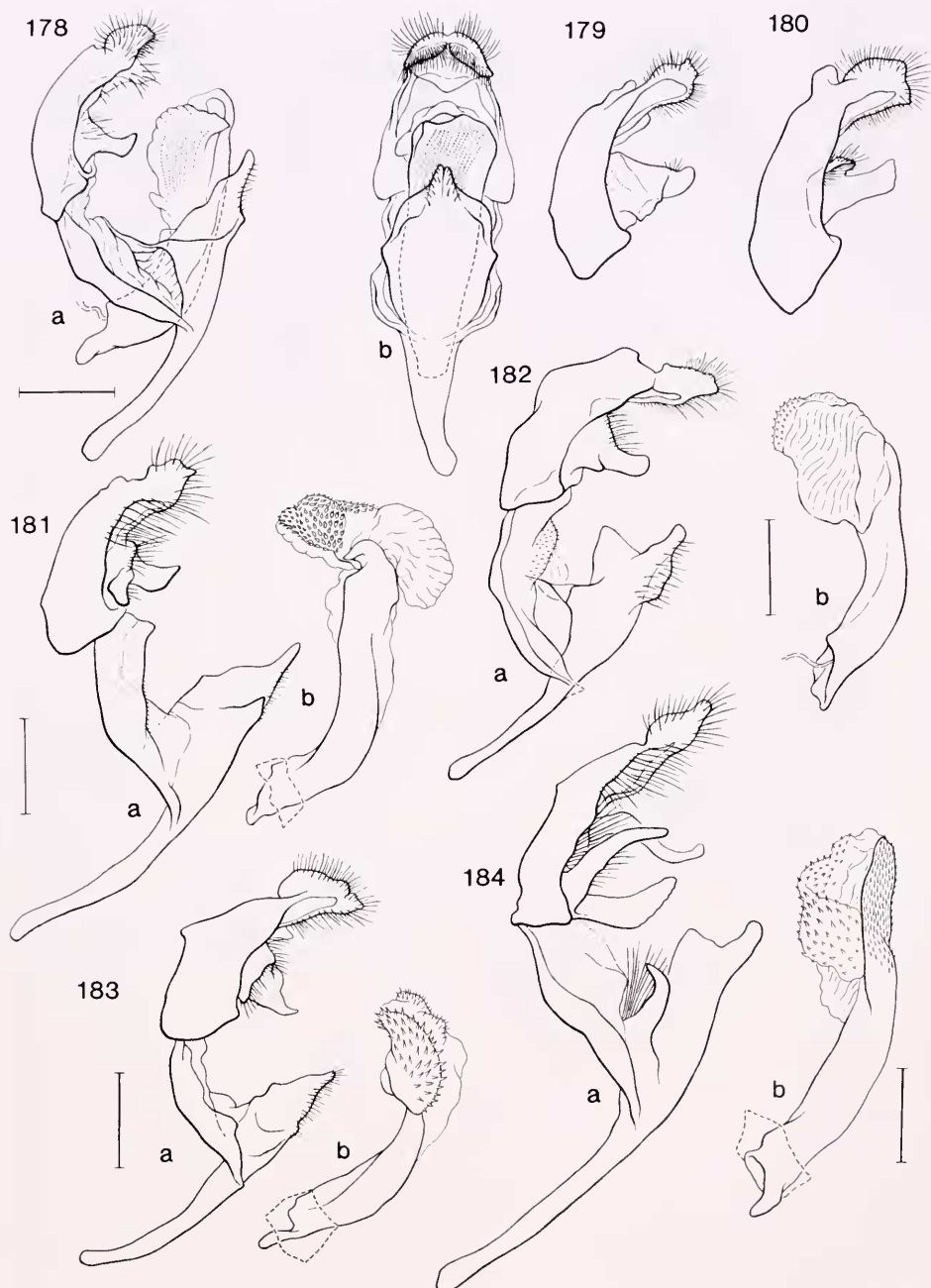
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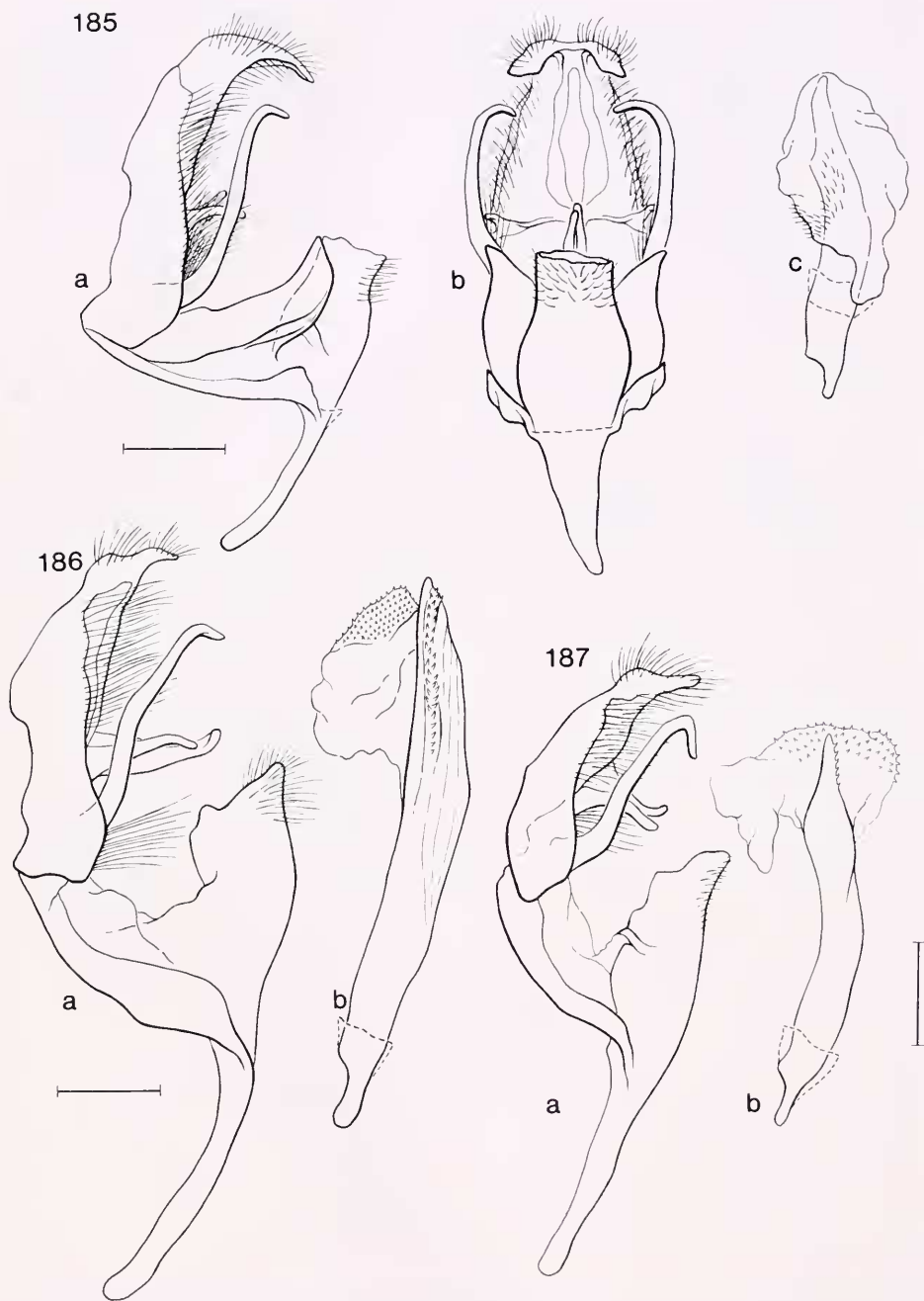
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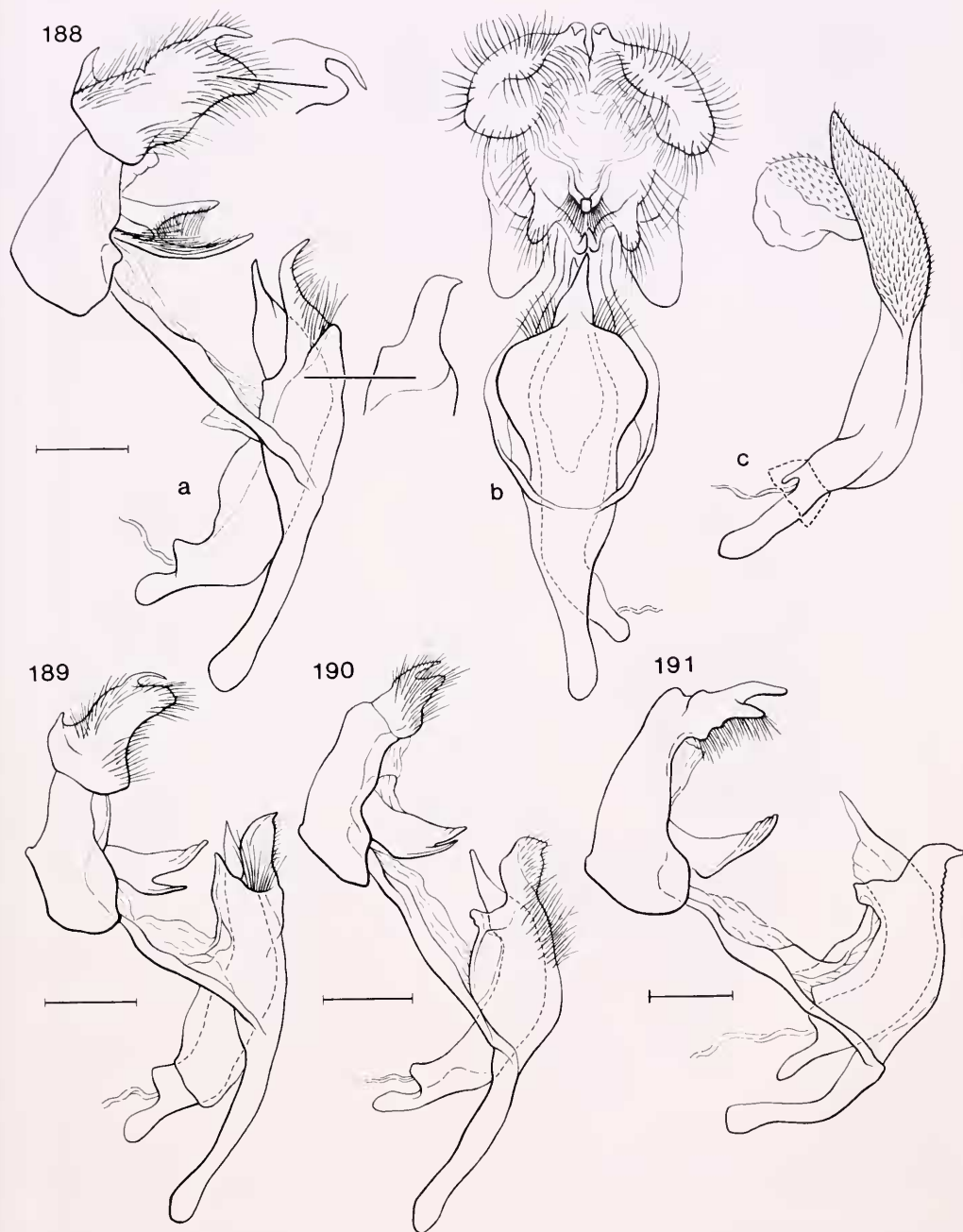
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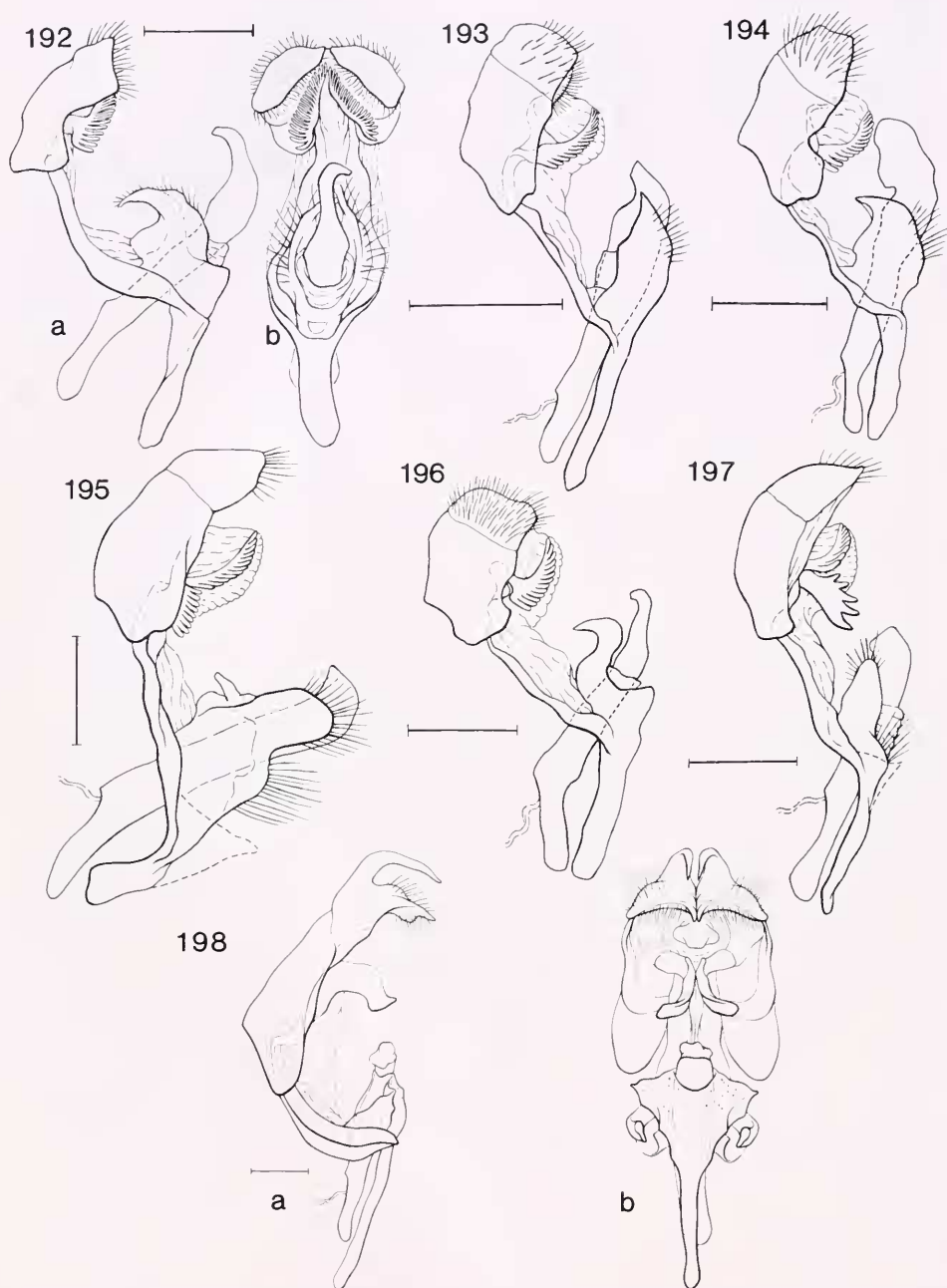
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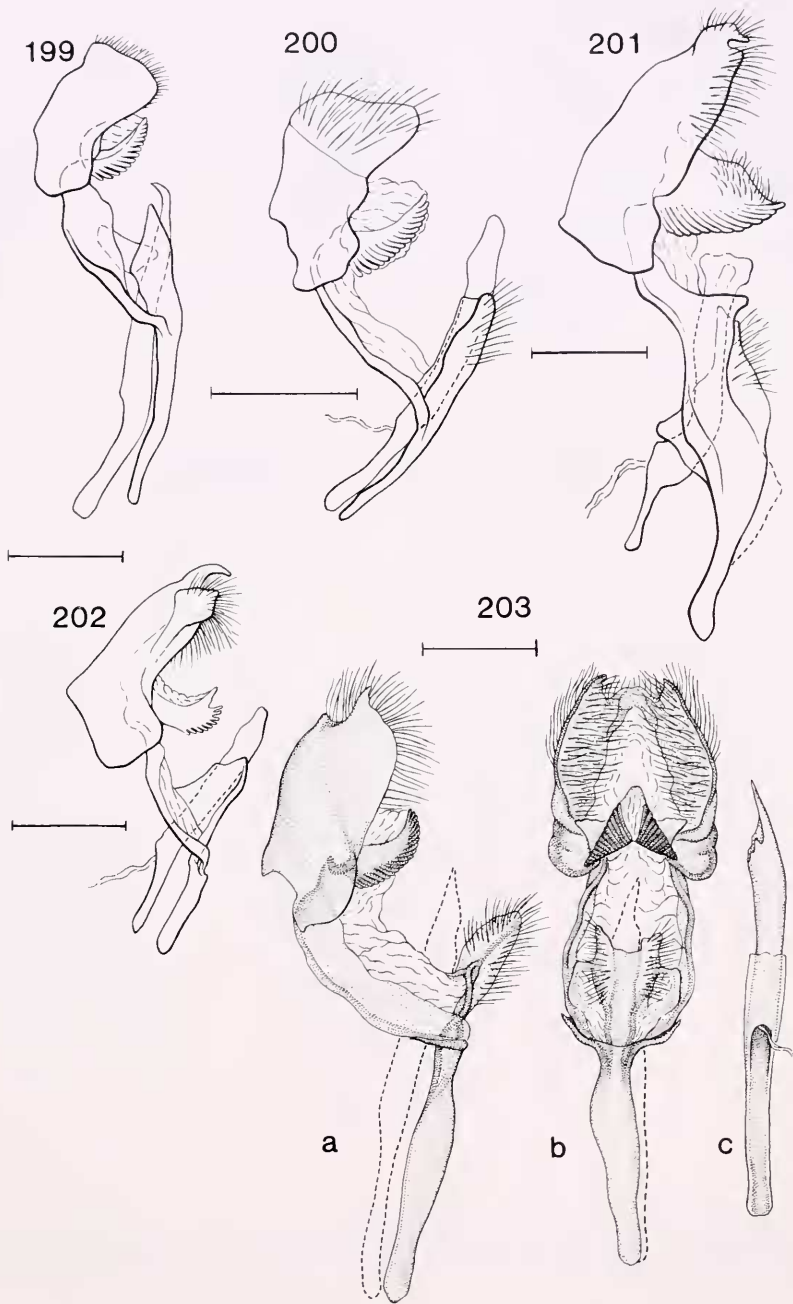
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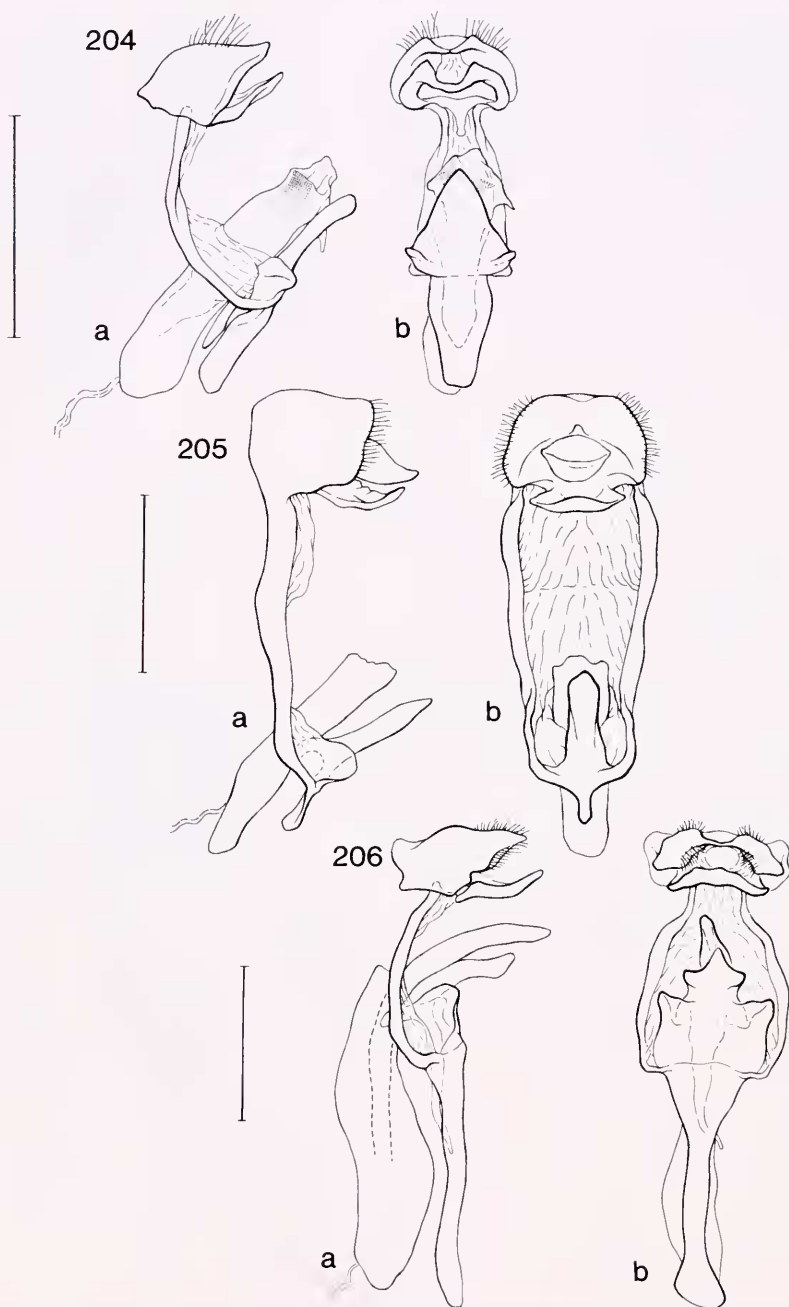
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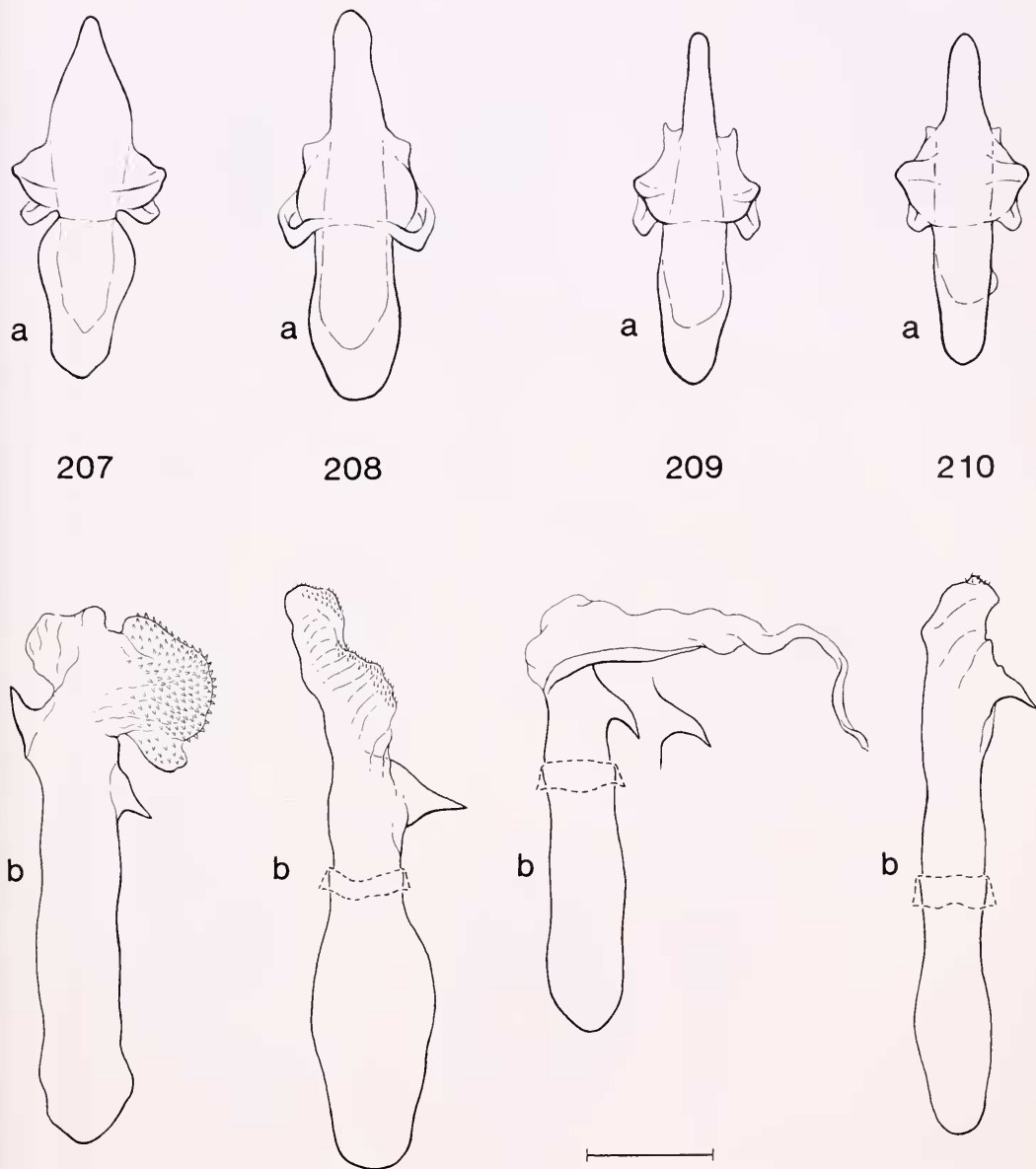
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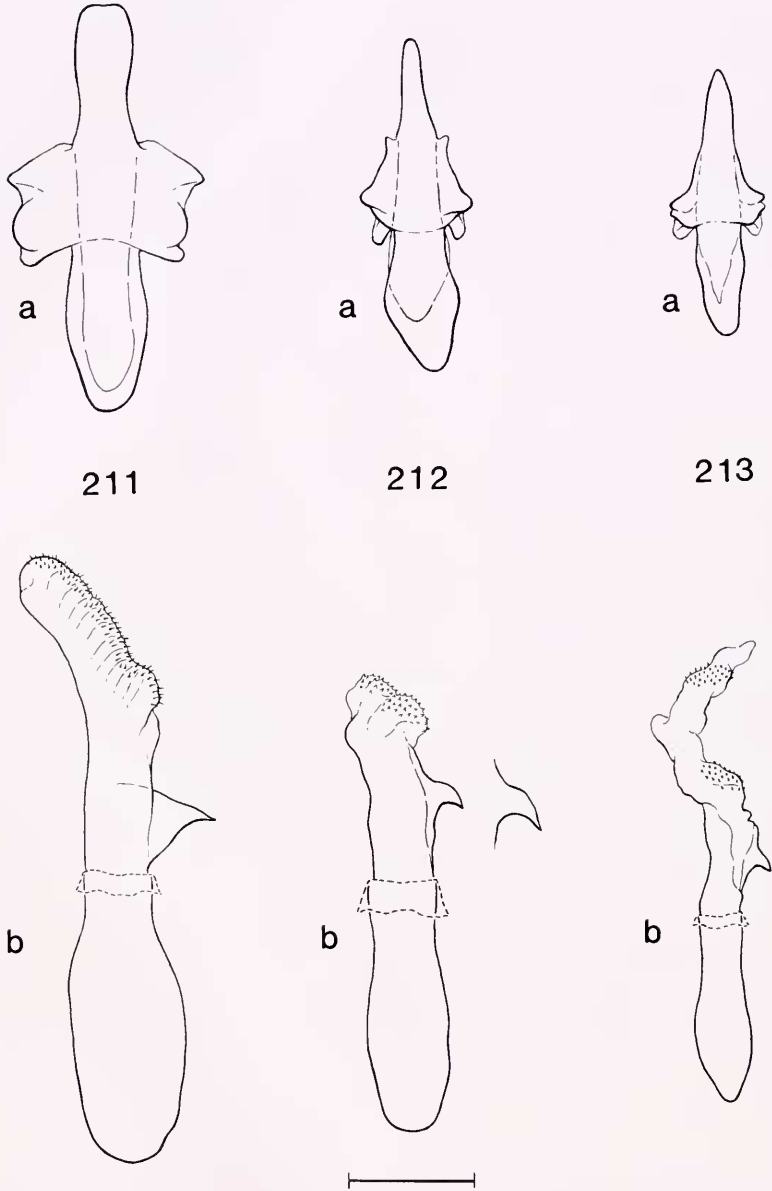
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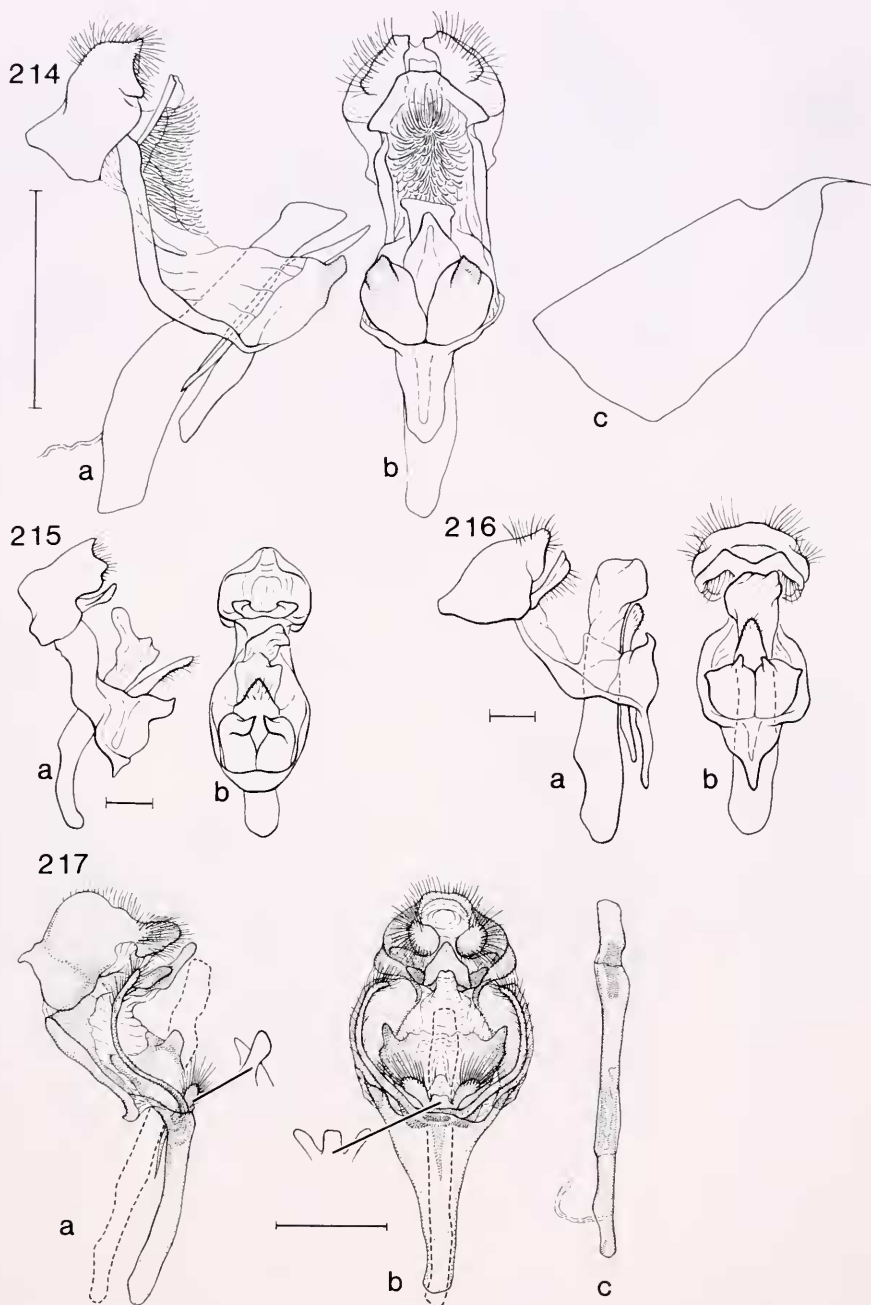
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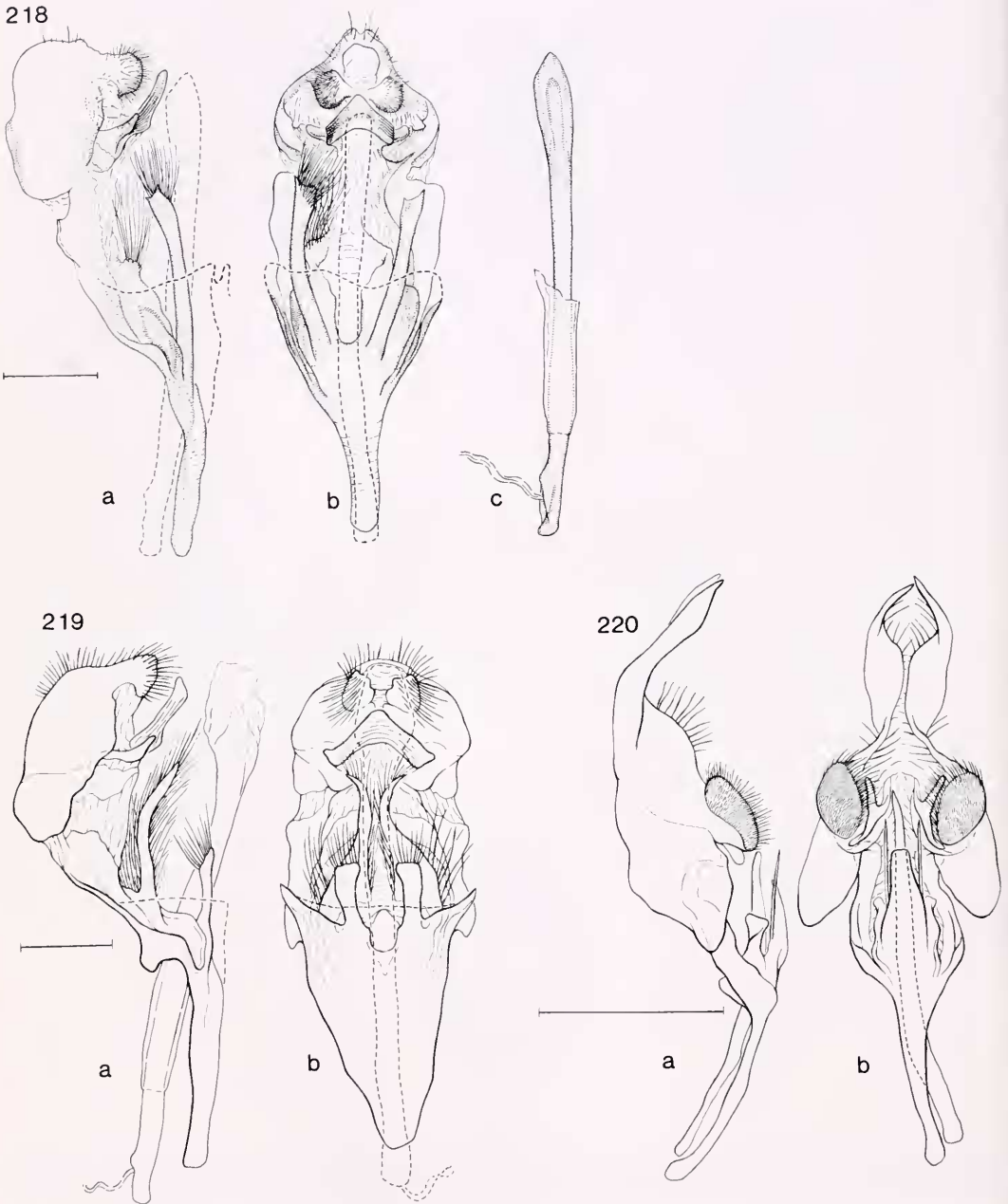
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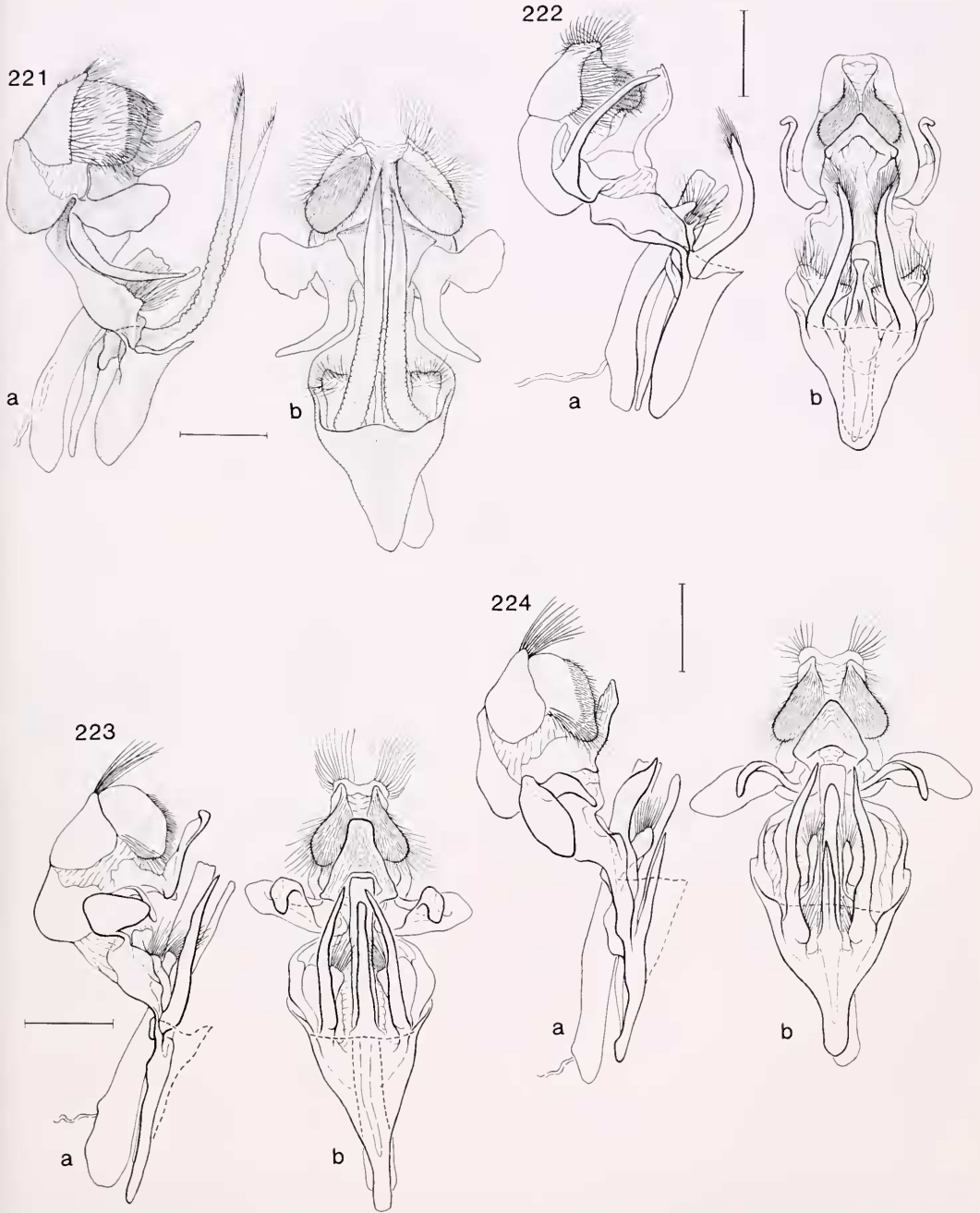
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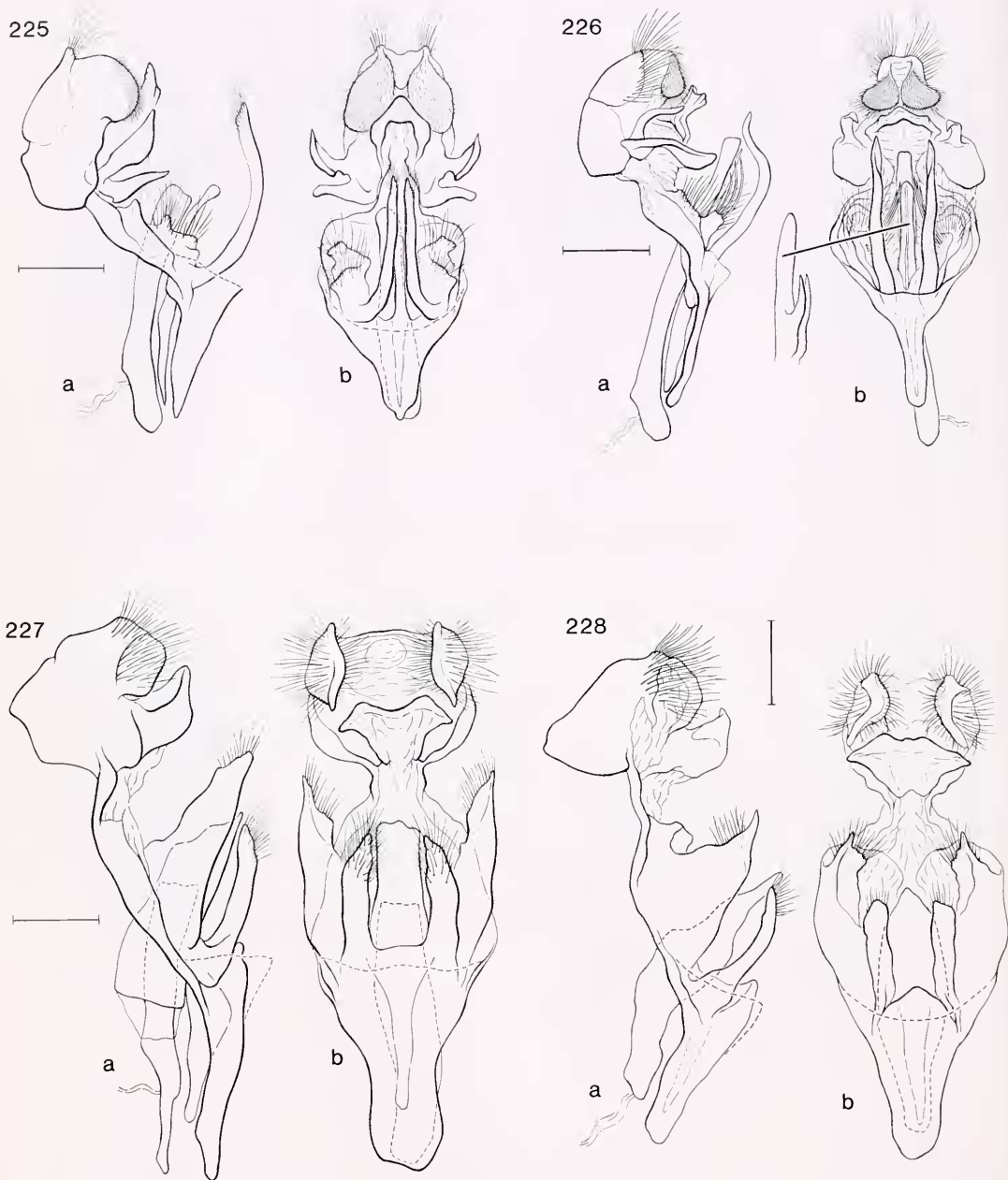
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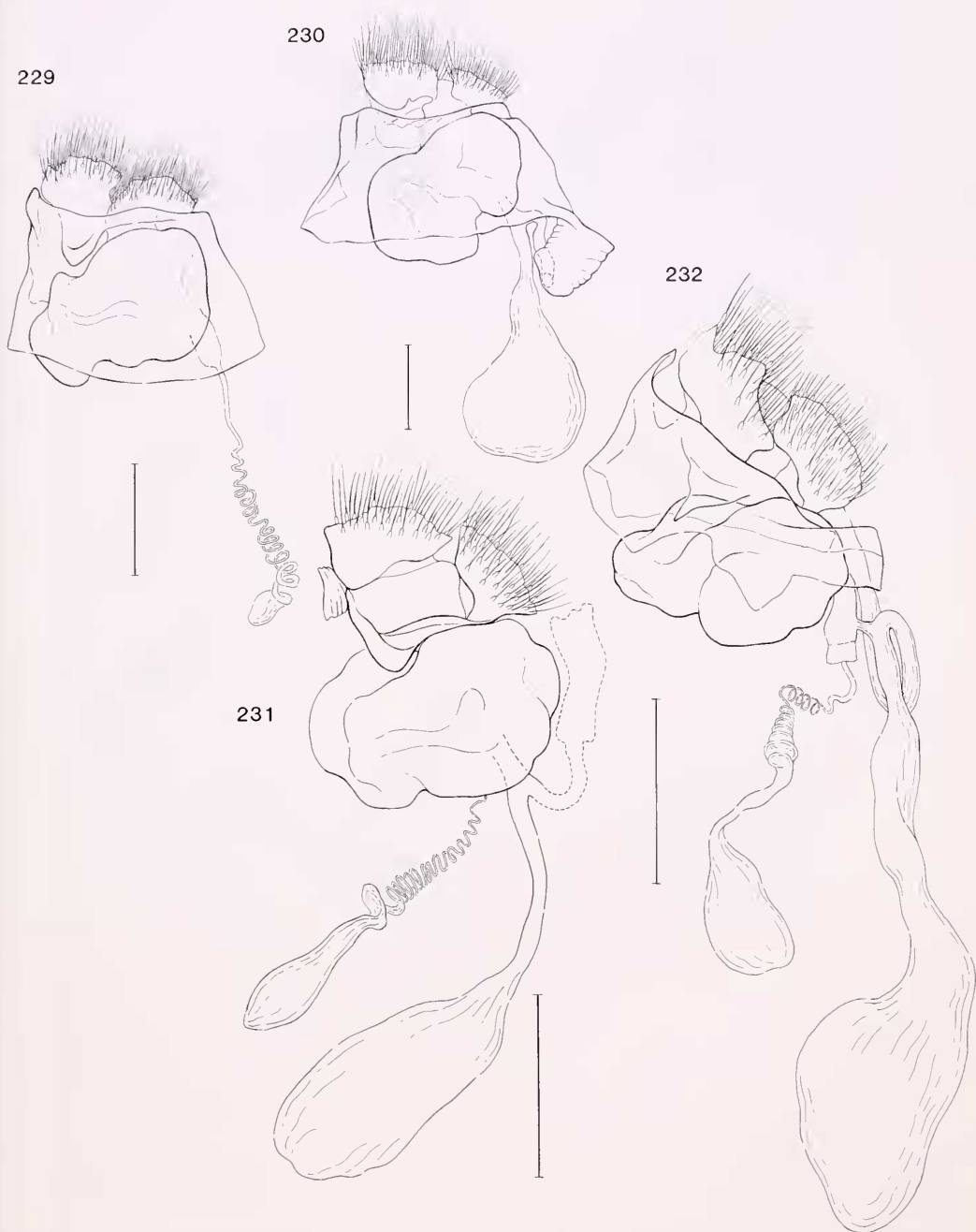
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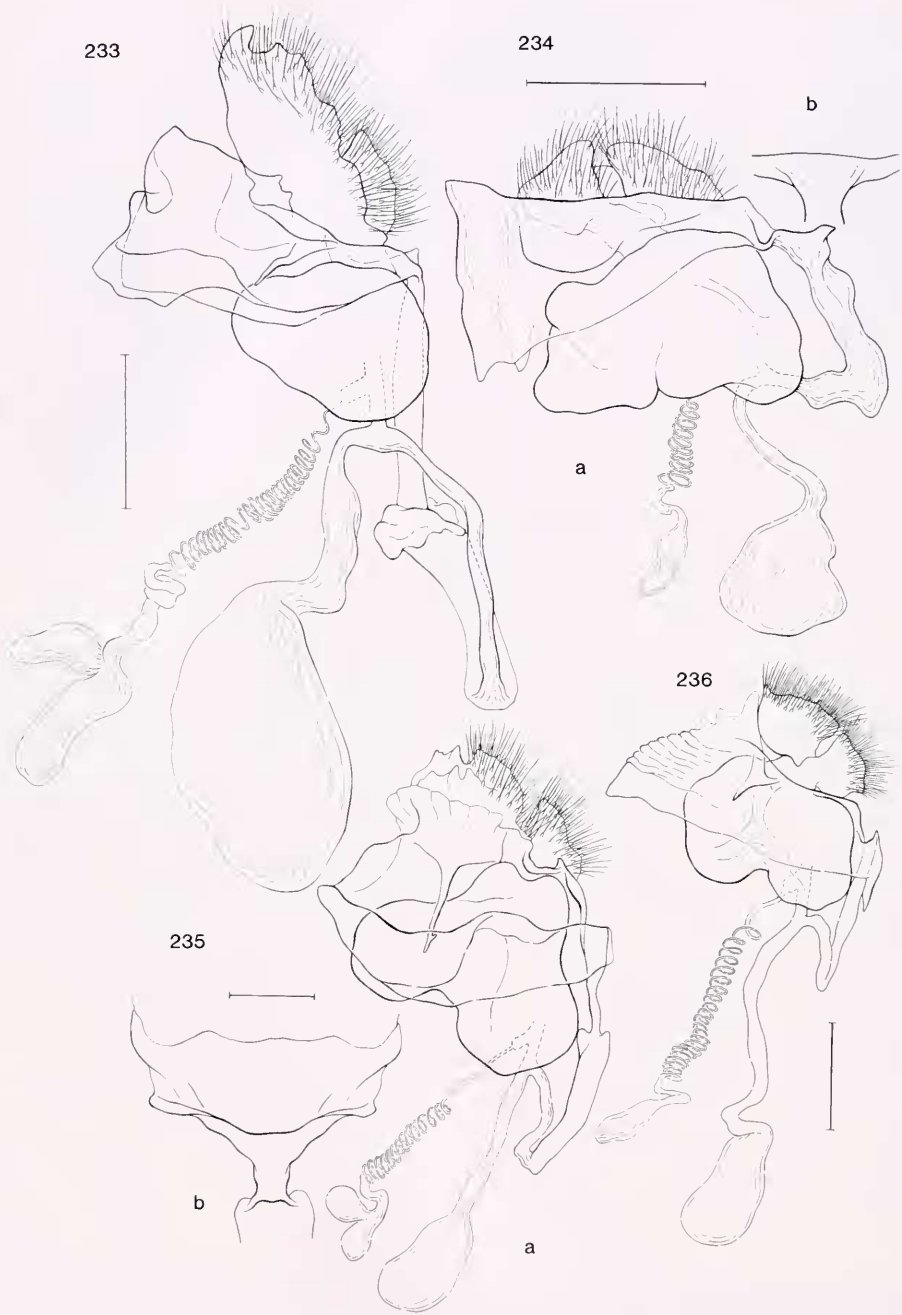
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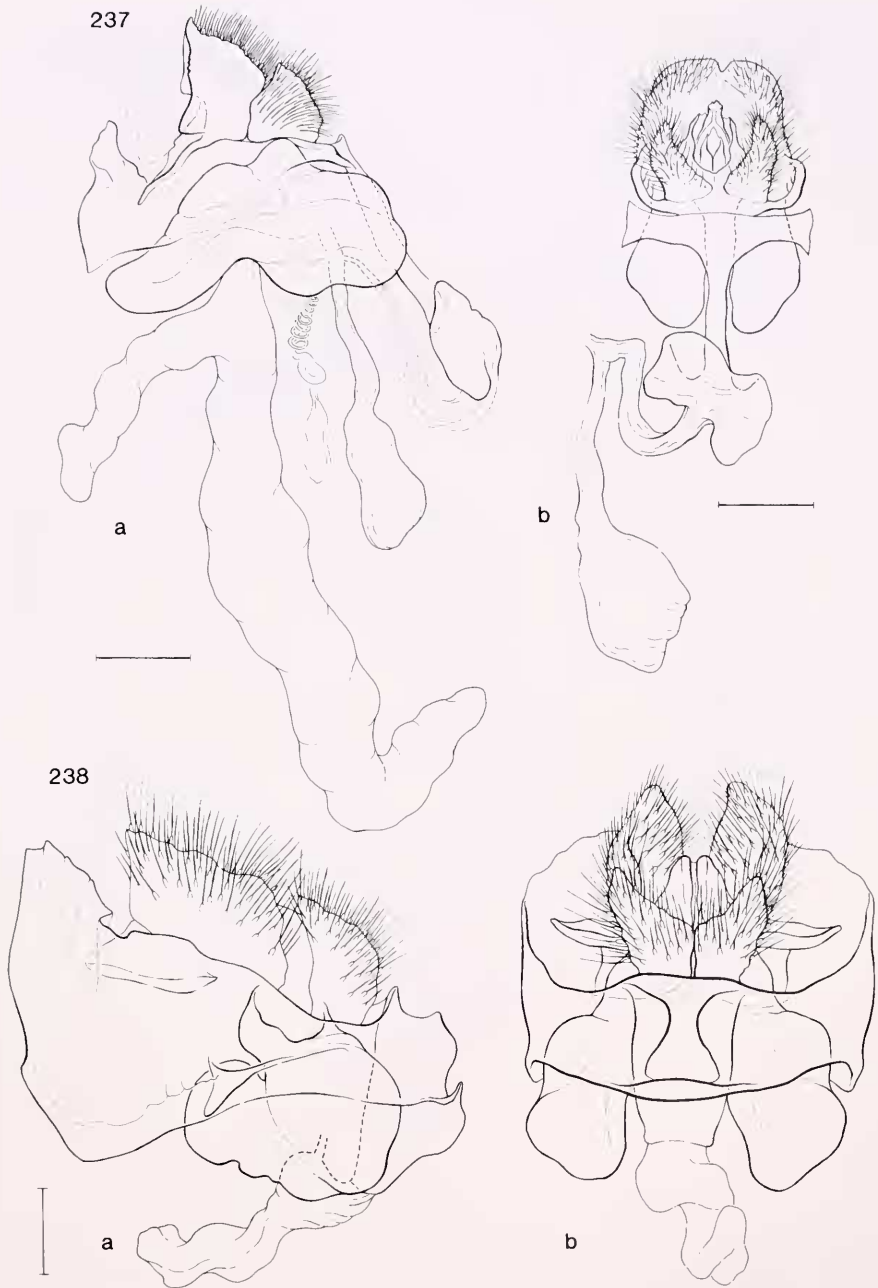
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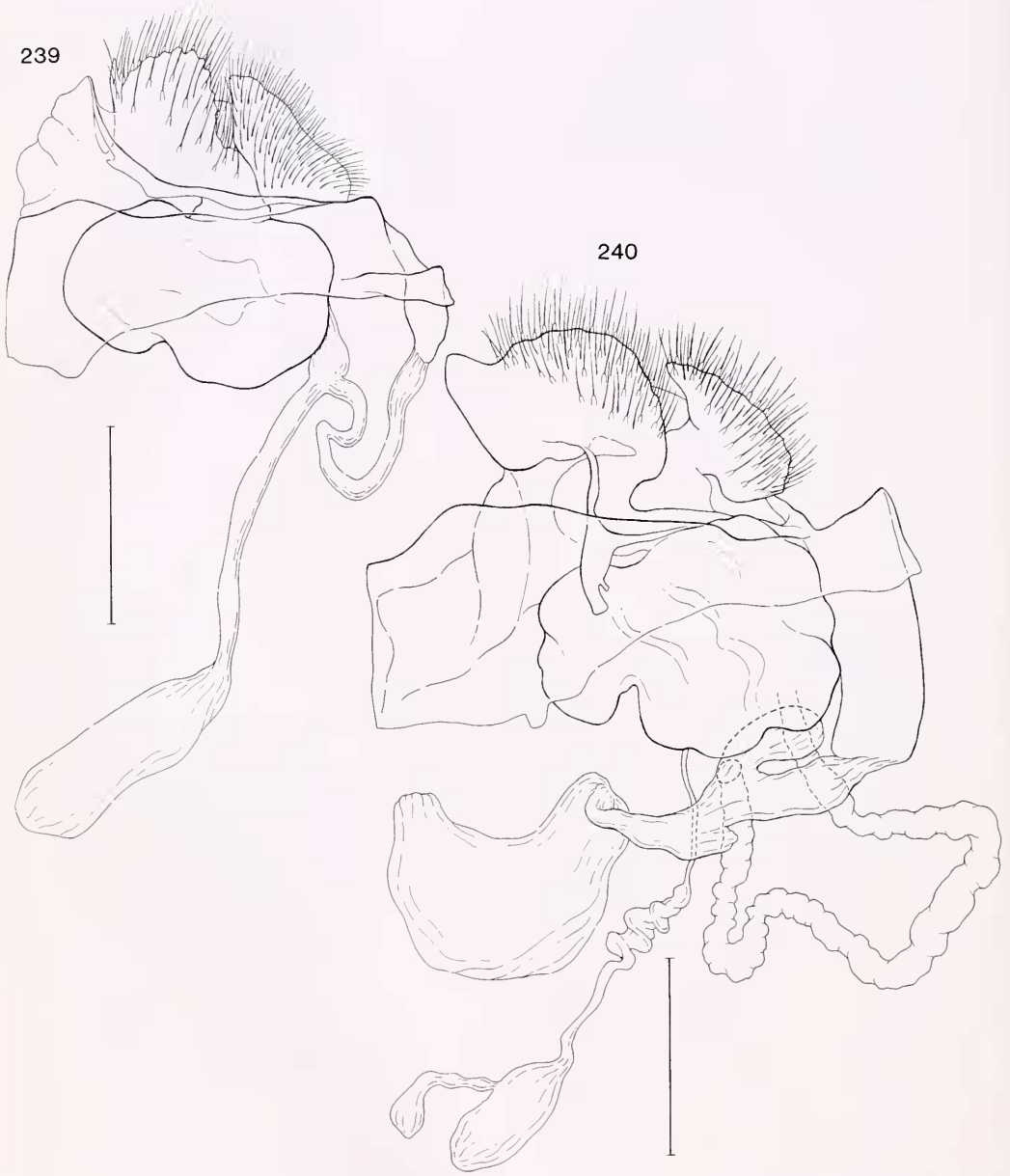
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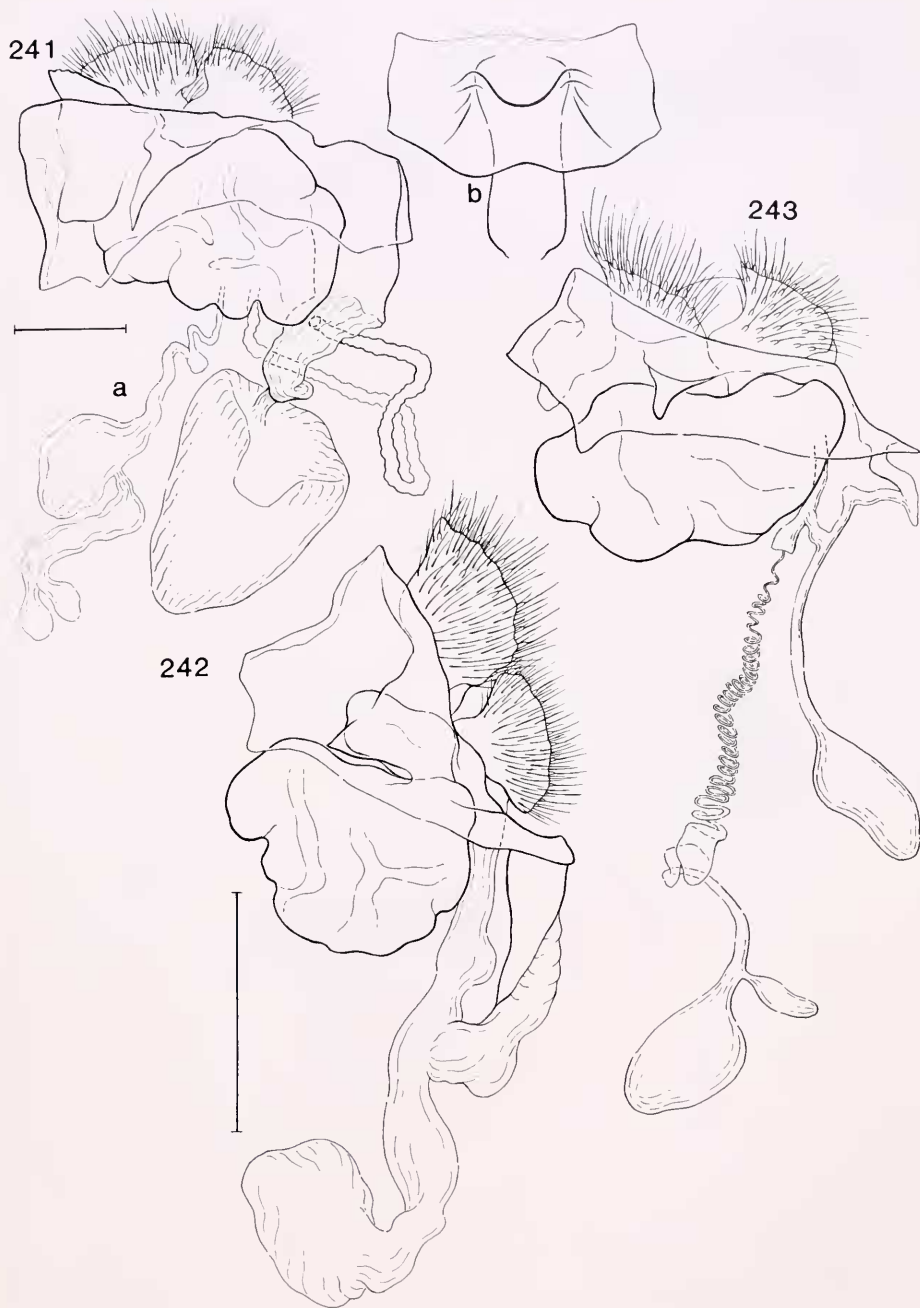
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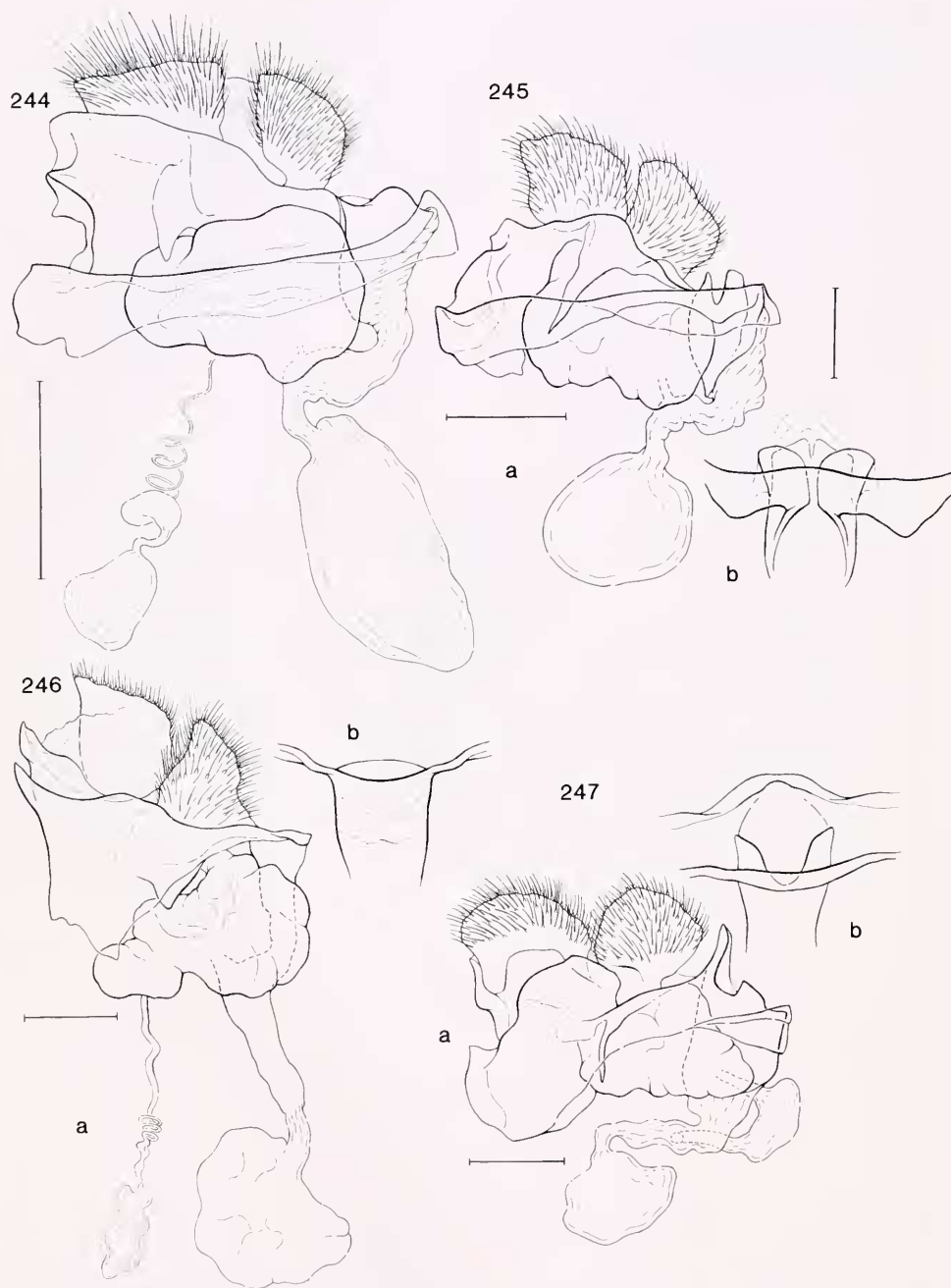
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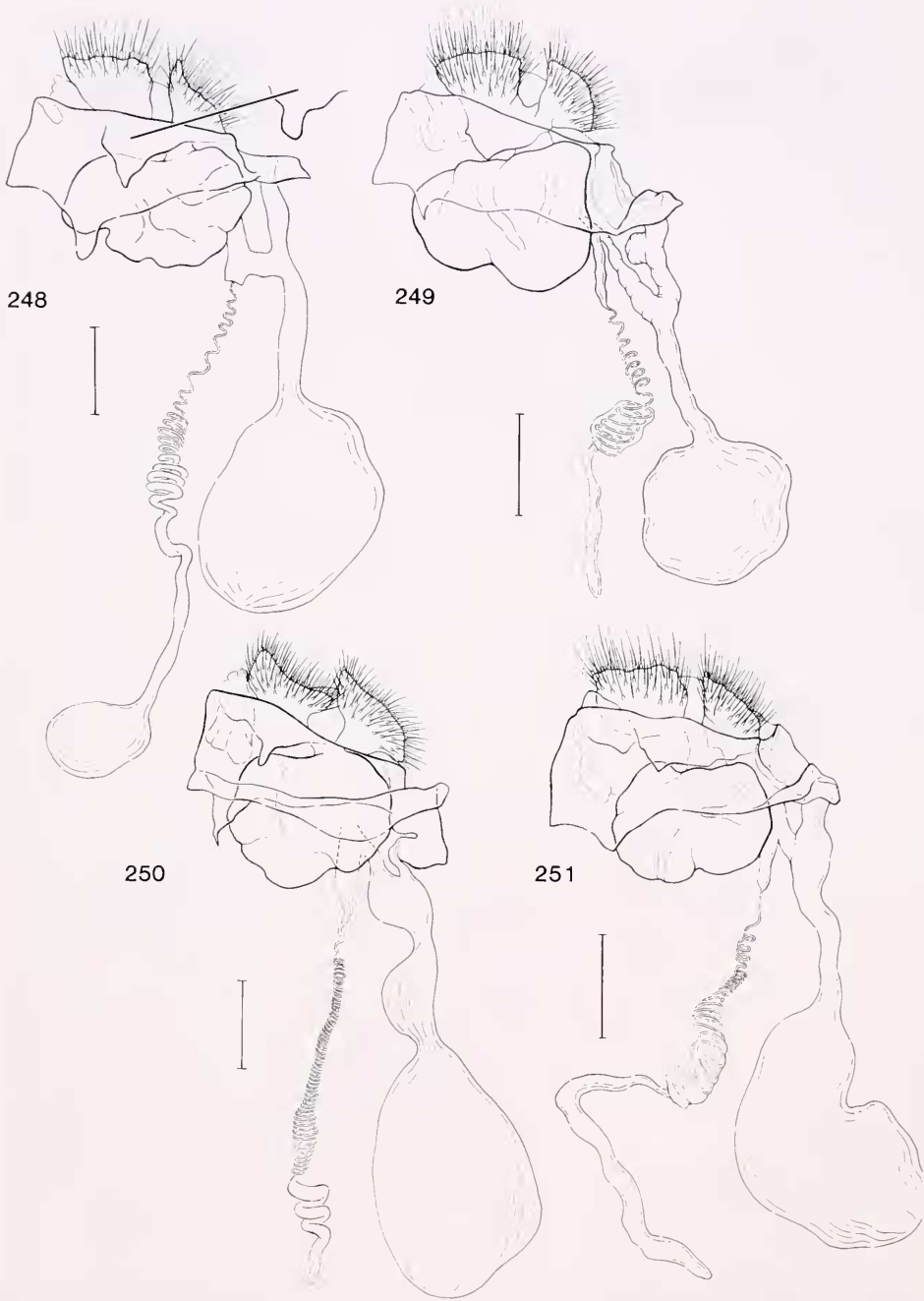
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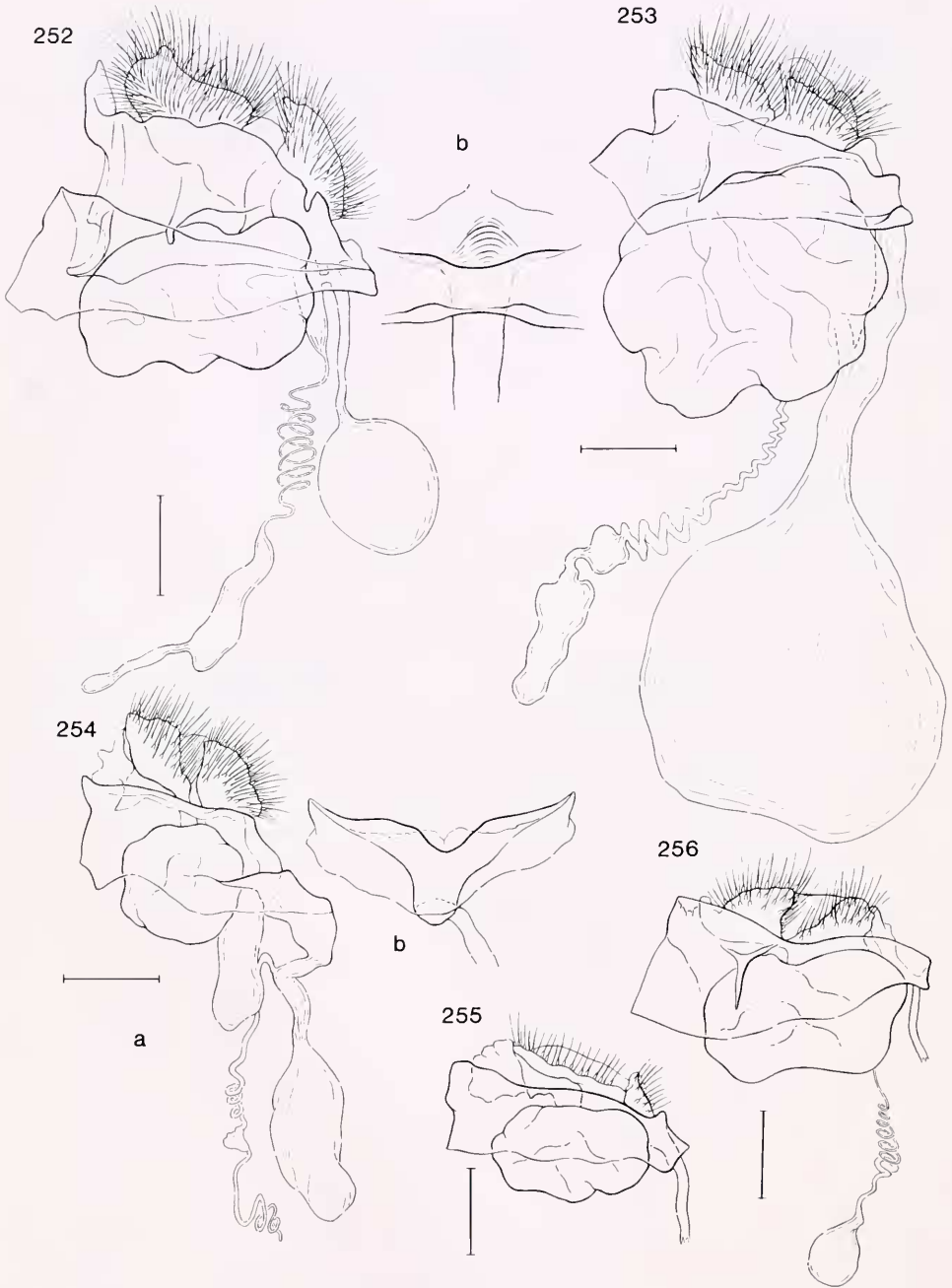
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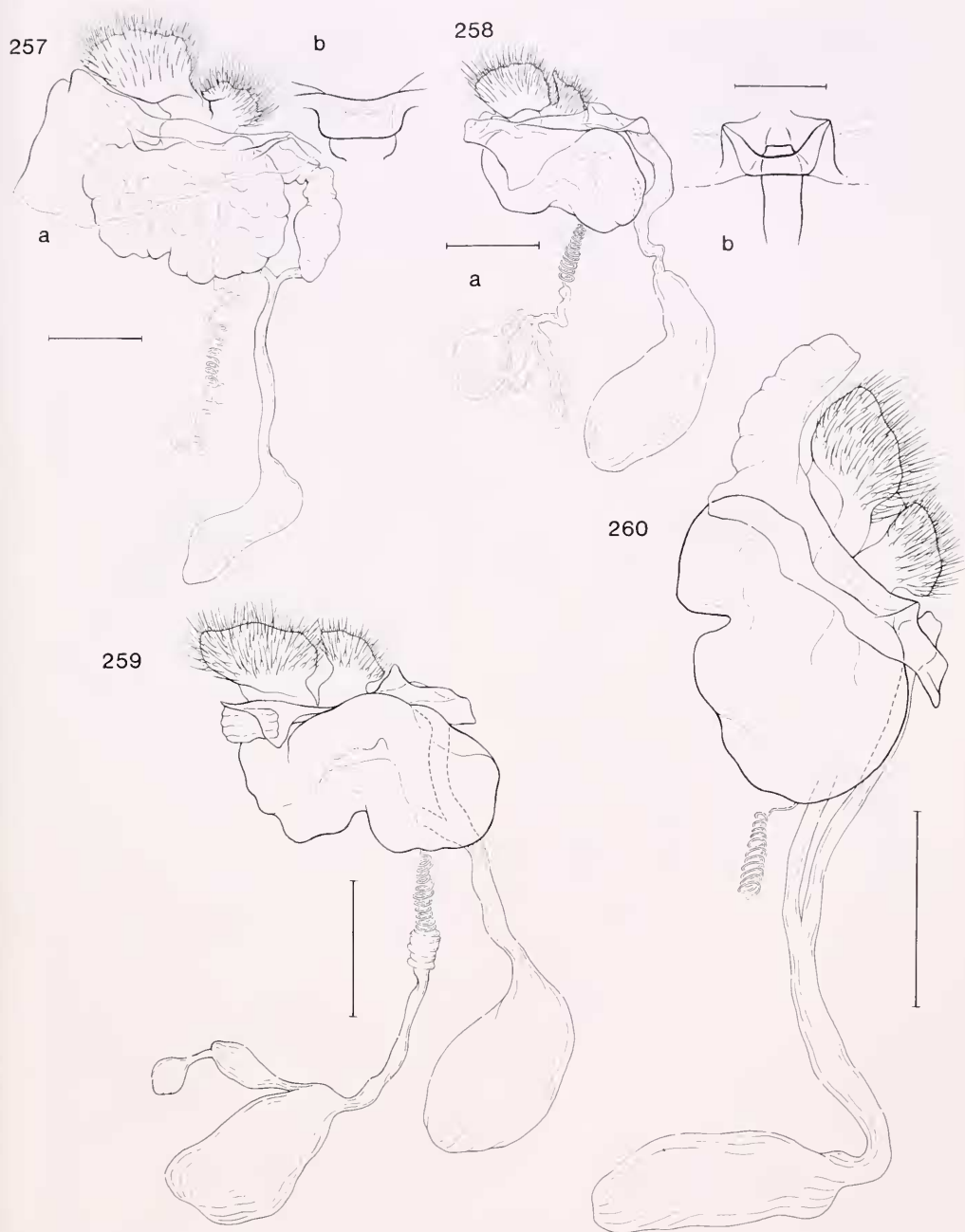
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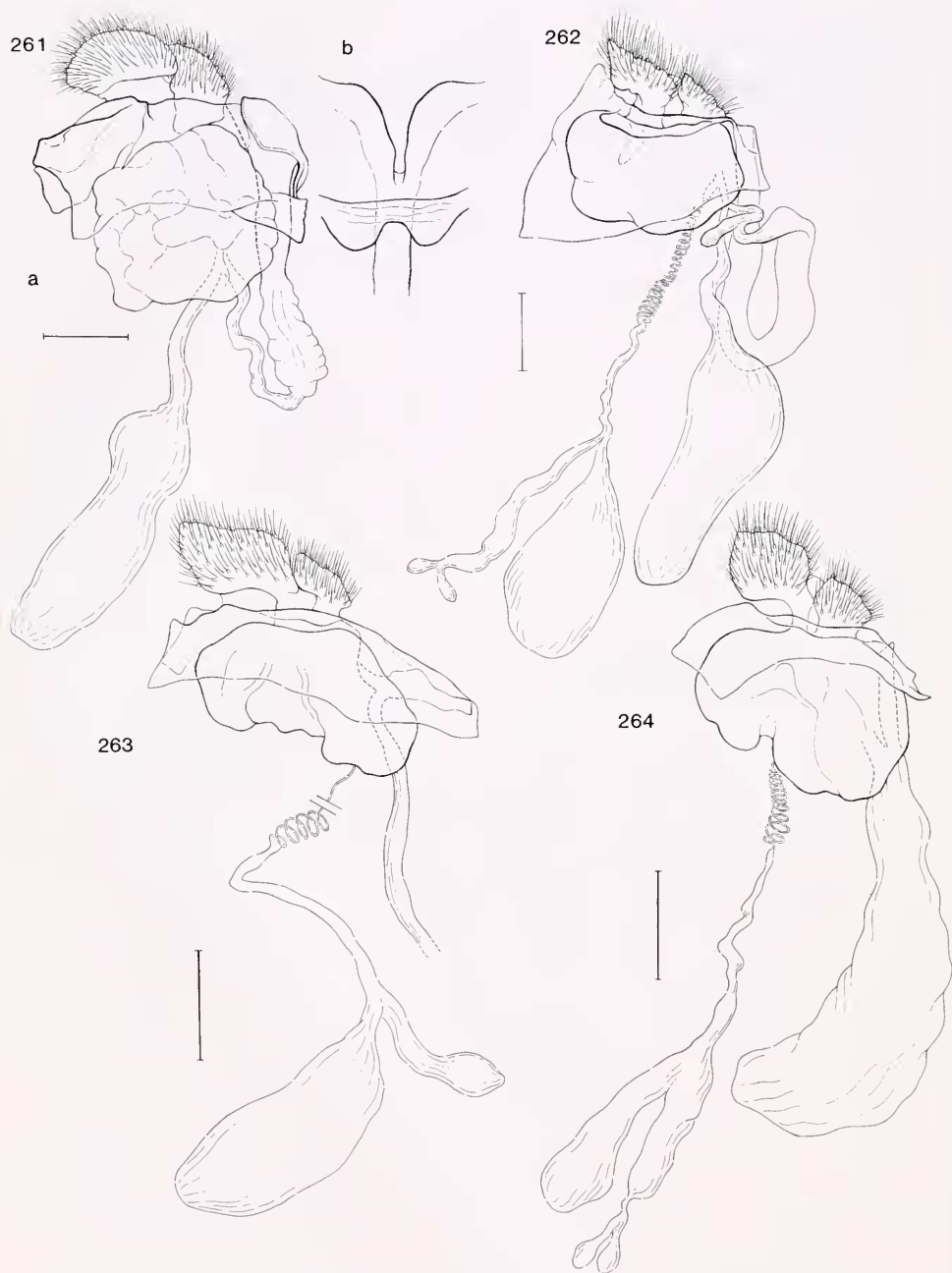
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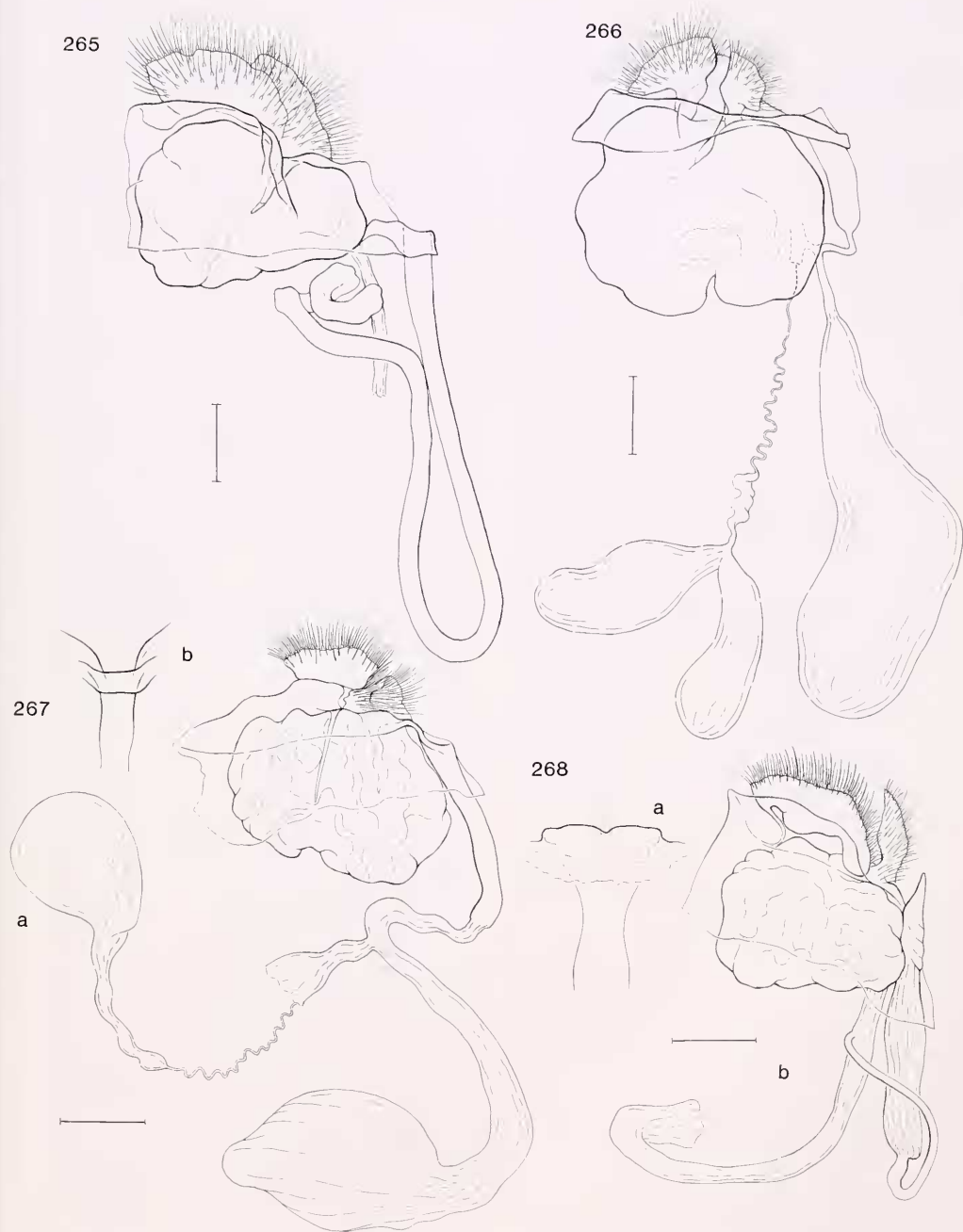
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